A SCHEME OF VOCATIONAL GUIDANCE FOR USE IN AN EDUCATIONAL AREA

THESIS

PRESENTED

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"We are not sent into life as a butterfly is sent into summer, gorgeously hovering over the flowers, as if the interior spirits of the rainbow had come down to greet these kisses of the season upon the ground; but to labour for the world's advancement, and to mould our characters into His likeness, and so, through toil and achievement, to gain happiness."

Beecher

F O R E W O R D

In presenting this thesis I wish to take this opportunity of expressing my deep appreciation and gratitude to all those who assisted me in the administration of this experimental scheme of vocational guidance. I especially wish to thank the Headmasters and teachers in the various schools for their co-operation in a task which was entirely new to them; the staff of the Ramsay Technical School who devoted so much time and energy in assisting me to construct and prepare the items in the practical intelligence and manual dexterity tests; Dr. Linklater and his staff who were responsible for the medical examination of the pupils tested in the scheme; employers and employees in the various industries in Edinburgh who so willingly supplied information for the occupational analysis; Professor Drever and Mr. Maxwell for their very helpful assistance in the preparation of the Standardised English and Arithmetic Tests; parents who so readily and conscientiously completed Home Reports; Mr. Alastair Macdonald, my brother, who was responsible for the drawing and colouring of the two hundred designs required for the Koh's Block Design Test; Miss Tait of the Education Offices who so courageously undertook to do the vast amount of duplicating work; Miss Ewart, our Department Secretary, who prepared the duplicate of this thesis; and last, but by no means least, the 955 boys and 883 girls who acted as subjects for this investigation.

I also wish to express my appreciation of the work done by the volunteer student testers who were responsible for the administration of the practical intelligence test. It should be noted that their work was of the very highest order and that their contribution to the scheme was one of the greatest significance and utility.

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Psychology Department,
Edinburgh University,
May 1939.

INTRODUCTION

The scheme of vocational guidance described in this thesis was one in which the Psychology Department of Edinburgh University, the Edinburgh Education Committee, and the Ministry of Labour co-operated, and was personally supervised by the author under the direction of Professor James Drever.

The Edinburgh Advisory Committee for Juvenile Employment had long held the view that it was the birthright of every child to receive, and the duty of every education authority to make available, individual advice as to his or her mental, temperamental, and physical characteristics, and what they appear to fit him or her for in occupational life. Towards the end of 1937, this Committee, on the instigation of Professor Drever, thought that the time was now opportune for an investigation into the possibility of devising a scheme for vocational guidance applicable to all children leaving school throughout the Edinburgh Educational Area.

Owing to the fact that the administration of such a scheme would have involved considerable time and energy on the part of those intimately connected with it, if every child leaving school was to be tested, it was ultimately decided to choose four of the largest Intermediate Schools in the Edinburgh Educational Area, and in so doing, cover some 2000 pupils (approximately one-third of the school 'leavers'). The scheme, necessarily limited in scope, was so planned as to interfere as little as possible with the ordinary school time-table, and the time spent by the teachers in the administration and scoring of the tests was reduced

C O N T E N T S

CHAPTER 1

THE PROBLEMS INVOLVED IN THE CHOICE OF A CAREER

"There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune;
Ommitted, all the voyage of their life
Is bound in shallows and in miseries."
Shakespeare.

The selection of the work, trade, profession, or occupation to which one's whole life is to be devoted, is not only a grave, but in most cases a very difficult problem. What am I fit for? This question is being asked constantly by boys and girls who are about to enter the industrial world. In most cases, the youth of today approach the problems of occupational life blindly and have but the vaguest ideas about the difficulties which beset an individual on his venture into the world of industry. Many adolescents have no clear conception of what types of work exist, nor of the training required for each occupational order, nor of how people find their way into the various branches of industry, nor of their own personal fitness for any particular vocation. The gravity of the problem of choosing the most suitable career cannot be over-emphasised, and there are few individuals who will not readily admit, as they look back on their past history, that the choice of a trade or profession was one of the most severe ordeals of their lives, and in the issue of which they have had, either usually to thank some element of good fortune, or to entertain some bitter and painful regrets. The situation, which confronts the adolescent at the commencement of his career as an economic being, is one to which he is entitled the utmost sympathy, as well as all the help that can be afforded him, for it is not to his advantage alone that he should choose well. It is for the common good that there should be as little aptitude and talent either misapplied in a direction unsuited to it or aimlessly wasted, whether in an occupation greatly above or greatly beneath its worth. What is beneficial to the individual in this respect is also beneficial to the community. It is, therefore, clearly evident that both communal and individual satisfaction can be derived from the wise and prudent choice of a career.

As we are primarily concerned with the problems that affect the choice of a career, the particularised consideration of the relation of the individual to a scheme of vocational guidance will be more fully dealt with in a later chapter. One may say, with little fear of contradiction, that the specialist in vocational guidance is chiefly concerned with individuals who are passing through the transitional phase of life known as "adolescence". Adolescence may be conveniently defined to be that period in the life of the human organism between puberty and maturity. The adolescent is neither a child, nor is he yet a mature and fully developed adult, he is, in common parlance, at "the awkward age". The seriousness of the problems pertaining to the choice of an occupation affect us still more forcibly, when we consider that this all-important decision has to be made during those comparatively hazardous years of transition. The adolescent, during this period, experiences processes of physical, intellectual, and emotional development, and those processes have far-reaching effects on his vocational outlook.

The problem of the most suitable age at which vocational guidance should be given to individuals is very intimately connected with the problem of adolescence, and many authorities on the subject of vocational guidance seem to neglect the complexity of the relationship. There are numerous instances of individuals who, prior to the ~~the~~ adolescent phase, have had certain firmly established ideas as to the choice of a career, but who, after this phase has passed, have had sometimes quite a different vocational outlook. Suffice it to say, at the present juncture, that the complexity of the processes in maturational development compel the vocational psychologist to take the view that individuals will, probably, derive the most beneficial results from vocational guidance during the later stages of this transition phase.

It would seem at a first glance, that the best help in the choice of a career must come from oneself in serious questionings and repeated trials of one's fitness and with wise outlook into the manifold branches of employment. Convenience and novelty of circumstance must never influence an individual in his choice of an occupation, such a procedure must inevitably, in the course of time, end disastrously both for the individual and for the employer. The subjective aspect in the choice of an occupation demands that the individual should survey the various branches of employment in which he has a genuine interest, and choose from this specially selected list of occupations those for which his innate aptitude will find the most suitable and congenial expression. It would, however, be a rather rash statement to say that individuals should rely solely on their own judgment in the choice of their future career, but it is essential that they should sound their own capacities, distinguish the intellectual operations in which they show weaknesses and limitations as well as those in which they show superior capabilities. They should, in other words, take stock of themselves, and in this 'stock-taking' they will note their physical, mental, and temperamental limitations, and the peculiarities and requirements of various trades and professions. Having taken such a step, an individual has gone a long way in the process of choosing his own career, he will meet the advice of others at least half-way and, in addition, this step will render that advice all the more likely to be sound and effectual. Under/

modern conditions, however, this process of subjective assessment is becoming of ever-increasing difficulty and complexity.

In 1935, the Ministry of Labour and the Headmasters' Employment Committee published a pamphlet (1) in which about fifty professions and careers were reviewed. The message of the pamphlet emphasised the vital importance of innate aptitude in this age of specialisation. One fears that, in this twentieth century world of ours, specialisation may occupy a much more important position than it should do. No one will deny the fact that, for a particular vocation, specialised training is indispensable, but many industrialists seem to forget that the choice of a trade or career for which an individual is inherently suited is the more important factor. No amount of specialised training will create a specialist, unless that individual is innately endowed with potentialities which with training can become actualities. The popular idea of the world of today is that any well educated person can adapt himself to any vocation, and it may be a very true statement to say that the young people of the present time rightly pride themselves on their educational and social versatility; but surely there is no justification for the over-confident and rather anti-social outlook, which considers every career on the basis of, "How much money is there in it?" It would seem, rather, that the prospects are not in the occupation, but in the individual. The fact that every individual is born with varying potentialities and varying limitations disproves the theory that any individual taken at random will be found to be a suitable person for a particular occupation. The fact that an individual has received a liberal education does not necessarily imply that his occupational versatility equals his educational versatility. Education develops an individual's innate cognitive, affective, and conative endowment; specialised training brings this development to its maximum potency, but there is no reason to believe that, even then, such an individual will become "wedded" to his vocation.

that, even then, such an individual will become "wedded" to his vocation. He may adapt himself to his vocation, but if he is not "the right man for the job", the adaptation is quite artificial, and there can be no harmony between the individual and the occupation. This scientific law of life seems to have been somewhat neglected by many individuals who find themselves unsuited to their particular vocation.

Young people have the advantage of a valuable form of knowledge if only they will learn to apply it to themselves and to everything with which they come in contact. "Know thyself", is a motto which every individual, on the threshold of his career as an economic being, should take to heart. If an individual knows his capabilities and limitations, he can regard his entry into the industrial world as an opportunity to do the thing at which he can best excel. This subjective aspect in the choice of a career is of paramount importance, since, in many cases, it serves as a starting point for the vocational psychologist. Far from detracting from the diagnostic value of the mental test, without the help of which, vocational guidance would be well-nigh impossible, it is important for us to realise that an individual should have his own ideas about his future career. The choice of career, without this active element in it, is quite a passive process, but where it is present in an individual, the vocational psychologist finds himself unable to agree with an individual's vocational wish, it is then that we see the real worth of his work. In such a case, two lines of action are then open to the individual, he can either follow his own occupational bent, a procedure which will, in all probability, result in occupational mal-adjustment, or he may follow the advice of the vocational psychologist a procedure which should result in success as an economic being. With the ever-increasing improvement in the diagnostic value of mental tests at the disposal of the vocational psychologist, the greater will be the expectation that the career advocated by him will be the most suitable one.

Though the subjective aspect in the choice of a career is of such vital importance to the individual and is of the greateat utility to the vocational psychologist, it does not follow that the individual should obey the dictates of his will entirely. Nor does it follow that an individual will be able to make the decisive choice of an occupational career for himself, in fact, very few have been able to make this all-important choice with complete satisfaction to themselves and to others, without having had, in addition, to seek some advice from an outside source. Men of great acquired ability, whether in architecture or engineering, in dentistry or surgery, in law or letters, are seldom content to commit themselves to any new plan or work of a critical nature without taking counsel with others as well or better qualified than themselves. If this be true of men who are already masters of their profession, how is it possible that an individual can venture to discard the advice of others on entering a lifelong career in which he is wholly untried? Save in a few instances of some extraordinary genius in an individual, which may decide the question of a career from the first, the average individual will seldom be in a position to choose wholly for himself; in that case he will rightly ask the advice of a vocational psychologist who has been trained in the methods of vocational guidance. Apart from the advice offered by the parent or the psychologist, the community itself has a control of its own in the choice of a career; for, on the conditions of its industries and professions and its demand for various services not always equal, depend not only the number of openings available for aspirants in this or that occupation but also the prospect of pecuniary reward which, though not always a safe guide in the choice of a career, can never be left out of consideration.

"The blatant lack of incentive among the present-day generation seems to account for the many failures in our economic, industrial, and professional spheres." This statement was made to the writer by the parent of a boy who had not fulfilled the hopes placed in him by his parents. Another said, "The youth of today are being coddled and bottle-fed, and have not to strive for the things they want, or the goals they wish to achieve." We may ask ourselves the question, "Is this a fair criticism of present-day youth?" In this twentieth century world of ours we quite rightly enjoy all the benefits which can be derived from scientific development and progress. The economic, industrial, and social conditions which prevail today cannot be compared to those of even twenty years ago. Times have changed, but can we, with any justification,also say that the human being has changed? There may be many who say that the incentive of the juvenile has been dimmed and blunted as a result of the onslaught of the many advantages that have accrued from scientific progress. But if one pauses to reflect upon the psychological nature of 'incentive', can one say that incentive has been curbed as a result of progress? The answer would seem to be in the negative, since incentive is akin to our instinctive drives and urges, and is part of the innate endowment of the human being; like instinct, it can be modified, developed and conditioned. We can, therefore, readily understand that if an individual does not possess a fair amount of incentive, despite the fact that he may possess the intellectual requirements for an occupation, he cannot hope to prosper in it if he has not the necessary drive and urge to prove himself occupationally adjusted. For an individual who is aware of his intellectual capacities and limitations, strong incentive is necessary if he is to continue his studies along the specialised lines which he has chosen. Environment, progress, development, and the like have not the controlling force over incentive that some people imagine, rather does the control rest with the individual himself who has the power to develop and use it as he so wills.

Neglecting, for the present, the personal influences which may affect an individual in the choice of a career, we come now to the consideration of the control arising out of the general state of affairs which prevail in the industrial world and its relation to the choice of a career. The diversity of the branches of occupational life is so immense and the continual change and extension, which those branches undergo, is so astounding that it is little wonder that the young person trembles on the brink of this vast industrial sea. This picture is in strict contrast to the conditions which prevailed under primitive culture. Specialisation in industry, as it prevails today, was quite unknown, in fact, the only specialisation attempted was the division of the world's labour between the sexes. We have travelled far since those early days and the division of labour, as it exists under present conditions, is a stupendous and diversified structure, and its growth from the primitive conceptions of industry has been spontaneous. The complexity of this industrial structure is not attributable to convention, for it has developed out of voluntary choice and the will of each individual in each industrial organisation to divide the work so that output may be increased. The advent of machinery greatly increased the spontaneity of this division of labour, and as the number of sub-divisions increased with the number of investions, so the degree of specialisation in the industrial world increased. In this way, the multitude of occupations in the great modern structure of world industry have developed from the primitive division of the world's work according to sex. The juvenile has, therefore, to consider problems such as, the overcrowding of a particular branch of industry, the shortage of skilled craftsmen in a particular sphere, or the opportunity of beginning, immediately on leaving school, to earn a good wage. The latter consideration naturally carried much more weight several years ago, when the spectre of unemployment called for hasty decisions. With the return of prosperity, the individual has the opportunity to, more or less, pick and choose. There are, however, many cases where expediency still drives in one direction - where parental responsibility clashes with hard economic facts. Where parental aims have forced the child to commence work in his early youth, individ: uality and undoubted innate capacity are some times shamefully cast aside and needlessly wasted. These are the hard cases and the vocational psychologist meets with type of rebuff repeatedly, especially in a scheme of vocational guidance like the one described in this thesis. But the young people who have had to take, or have been forced to take any job available, still have the great boon of evening classes and spare time study under expert supervision. It is classes such as these, which have paved the road to success for many determined young men and women, who have never, though beset by many difficulties and vicissitudes, lost sight of their goal.

Apart from the control arising out of the general state of industry in an educational area, it might be interesting to determine whether, in practice, the choice of a career is determined more by impulse or preference of individuals themselves; or, by the counsel and guidance of parents and experts. This topic will be much more fully discussed in a later chapter, when the reasons for the choice of occupation of the children tested in this experiment are analysed and reviewed. The question of parental influence in the choice of a career can, however, be conveniently discussed here.

It is generally held that parents have the most power in the occupational destination of their children; and yet it is a power which must carry along with it, at least, the assent of their children, which really is rather a ductile one. It is an assent founded on no real apprehension of what they are fit for, but simply on a willingness to be led and on a willingness to maintain a feeling of good-will towards the parent. The responsibility of a wise or unwise choice of a career, in so far as the choice is a family concern, rests upon the maintenance of a condition of harmony between the parent and the child. Let us glance, for a moment, at some of the weaknesses not uncommonly betrayed on both sides.

Where parents have ample means at their disposal they are apt to think that the choice of a career depends entirely on money and certain prescribed courses of education. In such a case, the child is usually 'consigned' into some vocational channel in which the family influences and connections are the sole qualifications. In professions where success depends upon performance in competition with others, this process of allotment is, almost always, fatal to its own purpose. In course of time, such a vocational environment is bound to cross swords with the individual, with the result that his industrial efficiency is impaired and a feeling of monotony and boredom is fostered. If, however, the individual sees the importance of ascertaining for himself a subjective estimate ~~estimate~~ of his own fitness, then parental advice can be taken or rejected. When the individual feels within himself that a certain proposed career demands more than he can offer, then he should not hesitate for a moment to make this feeling known. Any normal parent will listen to that, and his appeal will have all the more weight if he is able to say where his particular occupational lies. This type of procedure is the only one which, in the long run, will bring happiness to both parties concerned. In contrast to the parent who has ample means at his disposal, there is the parent of exceedingly modest means. Such a parent may have once been rich, or may have always been poor, and all they can do, in the question of the choice of a career, is to wish well and entertain the best hopes. In such a family, one often finds individuals who possess capabilities for much more specialised vocations than those which, through circumstances outwith their control, they have had to choose.

In a speech delivered a few years ago, Sir John Reith spoke of the days of his youth which he spent as an apprentice in a profession in which he always "kicked against the traces". He found himself an engineer, because his father had so decided. How many boys and girls of today find themselves in an exactly similar situation, chained to an unsuitable occupation which has been chosen for them by their parents? The degree of parental influence in the choice of a career is sometimes negligible, but more often than not, it is of considerable significance and merits the attention of the vocational psychologist. Many parents often influence their children towards a choice of occupation which is quite unsuitable for them, and they think that it is the natural and proper thing to select a particular career for their child. The choice made by parents are actuated by surprisingly divers motives.

One of the most powerful motives operating in the parental choice of a career is social snobbery. This motive is very common and actuates many a proud and conceited parent to speak of, "My son, the Naval Officer", or, "My son, the Financier". Such a motive may appear, on the surface, to be so contemptible as to warrant disbelief, but there are hundreds of such cases today. It is still a more common occurrence to find parental opposition to a child's occupational ambition, because such an occupation does not quite fit in with the social ideas of the parents. In light of such facts, one has to admit that many of the occupational misfits are misfits due simply to this irrationality of parental motive.

Pursuing further this question of parental influence in the choice of a career, we come now to consider the father's career in relation to his son's. This is an extremely controversial topic! It is not infrequently found that many a father is dissatisfied with his own career, and that this feeling of dissatisfaction prompts him to thwart all attempts, on the part of his son, to "follow in his father's footsteps." In so doing, the father refuses to believe that, while he may have been wholly unsuited, both temperamentally, intellectually and physically for his particular occupation, his son may be very well fitted for it. It is, however, a far more common occurrence for the father to wish that his son will follow in his footsteps. As in the first instance, this attitude is quite erroneous and is unfair to the child, since it neglects the fundamental principle that the child may not be mentally endowed to follow his father's career. There is, however, a much more subtle example of the parental influence on a career, namely, the thwarted ambitions of the parent. Such a parent sees in his son the realisation of his own personal occupational ambitions. Denied the chance of attaining his goal, he has probably had to be content in an occupation below his intellectual status, and, as a result of this, he has never had the opportunity of realising his life's ambition. In his son, he sees the possibility of this realisation and chooses the career which he (the parent) wished to follow. This procedure, as has been stated above, is fraught with many dangers and difficulties, and demonstrates that parental bias and prejudice, either for, or against any particular vocation must be completely eliminated, if a satisfactory choice of career is to be made. Admittedly, a parent's wide experience of the conditions operating in a certain occupation cannot be cast aside as worthless, but one generally finds that a parent, who is dissatisfied with his own career, is usually mentally and temperamentally unsuited for it. This spirit of dissatisfaction often has an unsettling effect and any mention

of the parents

of the parent's career, on the part of the child, is immediately ignored and cast aside as being unpractical.

A survey of the question of parental influence in the choice of a career impresses upon us the immense value of the subjective aspect in this all-important choice. Individuals who have a consciousness of their own in their choice of career have gone far towards the determination of their existence as functioning units in the industrial world, and yet, one is reminded at every step of the dangers of making oneself the sole judge in such a vital problem. It has been said that a child will sometimes take the advice offered by someone outside the family circle far more readily than if offered by the parent. Such a procedure may, however, lead to disastrous consequences and may, indeed, wreck a promising career. It is, therefore, of fundamental importance that the external influence in the choice of a career should be thoroughly scrutinised. Who are the individuals outside the family circle who are qualified to give advice to the youthful adventurer about to embark on his lifelong career? What can the vocational guidance psychologist offer towards the solution of this problem?

The one thing the youth of today can be certain of is that there is a definite place for him in the scheme of national life. It is the duty of every individual, with the help of the vocational guidance psychologist or other vocational counsellor, to find what his place is and to fit himself to fill it adequately. The urge to fit oneself for a definite task is the only motive powerful enough to overcome difficulties and disappointments. This urge is the secret of success, the discovery of which has given everlasting inspiration and hope to many individuals whose years of toil, prior to this discovery, have been years of aimless drifting, deadening monotony, and nerve-racking drudgery. Those, who set out in life with this ideal of service to spur them on from the beginning, need fear no obstacles. Great and sustained effort is always worth while to those of clear conviction - the conviction that

the course that they have mapped in counsel with others is the right one. It has been the aim of the writer to help boys and girls to map this course, the course for which they are inherently suited and the one which, in the long run, will bring them a feeling of happiness and contentment in their work.

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Chapter 2

THE TASK OF VOCATIONAL GUIDANCE

"It is our business to make both a science and an art of human nature. As in the physical world we select first the material suited to our purpose, then turn the iron into stell and temper the steel for the knife, so in the world of human action we must learn to select the right man, to educate him and to fit him for his exact task. This indeed we try to do in all our social institutions, religions, commerce, systems of education and government. The nineteenth century witnessed an extraordinary increase in our knowledge of the material world and in our power to make it subservient to our ends; the twentieth will probably witness a corresponding increase in our knowledge of human nature and in our power to use it for our welfare."

J. McKeen Cattell, "Homo Scientificus Americanus", Science, 1903.

It was indeed a great day in the history of the human race when some ancient nomad decided to settle down and begin scratching the soil with a sharp stick so that it would grow crops for him. Toil and labour, as we now know them, originated from those early beginnings to cultivate the soil. Primitive men themselves realised dimly what a momentous change this meant for them and later generations wove legends about gods, like Osiris and Cadmus, who came amongst men to teach them about agriculture and raise them out of savagery. Gradually, primitive man added one food plant after another to his stock, he learned to domesticate animals, he learned to grow flax and clipped the wool of his sheep so that his wife and daughters might spin and weave clothes for the household. Meanwhile, the sharpened stick had given way to the ploughshare and the forward march of the human race, as marked by improvements in agriculture, had begun; and to this day, despite all the other vast industries that have grown up to serve us, agriculture remains the foundation of our great industrial ediface.

Vocational guidance was not a complex problem in those days of primitive culture and the only specialisation of labour, which now is such an essential element in the modern world of industry, was the division of the world's toil between the sexes. One might venture to say that perhaps the office of medicine man in a tribe or that of tribe chief indicated some degree of specialisation, but however much this is the case, almost the only type of specialisation attempted was that which designated that certain types of work were for men and that certain were for women. In such a barbaric environment vocational guidance was a comparatively simple matter, on the one hand, there was hunting, fishing and fighting for the boy, and, on the other hand, there was cooking, 'dress-making' and agriculture for the girl. It will be noticed that the latter occupation is classified as feminine, since almost all agricultural work was performed by the female sex in those early days. The question of the degree of intelligence necessary for success in those primitive occupations was ofvery little importance, since every occupation could be performed by individuals who were physically fit and of varying degrees of ability above the level of idiocy. It will be observed that, even in those far-off days, mental deficiency was regarded as being detrimental to success in occupational life.

When we come to consider the evolution through which man has passed, we are amazed at the vast difference between the primitive sub-divisions of labour and the complex and intricate industrial organisation that exists today. When primitive culture held sway there were comparatively few occupations from which the individual could choose a career, present-day individuals, on the other hand, are assailed by a multitude of occupations from which to select their future occupation and as time passes this matter of choice will become increasingly more difficult. No longer can one say that such and such an occupation is a 'man's job' or that such and such an occupation is a 'woman's job'. Sex differences, although playing an important part in the choice of a career, continue to exert an ever-lessening influence. This fact is vividly impressed upon us if we look at the following statistics taken from the Census returns for the years 1921 and 1931.

Profession	Number of women employed 1921	1931
Barristers	20	79
Solicitors	17	116
Doctors	1253	2810
Dentists	296	394
Veterinary Surgeons	24	84
Chartered Accountants	43	119

We see from the above that, even in this small list of occupations, there have been substantial increases in the number of women employed in careers from which they were completely debarred some fifty years ago. A glance at some of the other returns will emphasise the point still further. There were, in 1931, 51 women employed as Land Agents, 53 as Foresters, 25 as Shepherds, 848 as Smiths, 44 as Mechanical Engineers, 122 as Glaziers, 294 as Riveters and 478 as Cabinetmakers, to mention only a few of the 'unusual occupations' followed by the women of this country.

When we consider primitive youth and modern youth in their choice of a career, three essential differences are revealed. In the first place, owing to the highly specialised nature of our occupational systems, the modern youth is confronted with the difficulty of having to choose his future from a multitude of occupations in contrast to the youth of primitive culture whose choice was very limited. In the second place, the complex differentiation of labour, as it exists today, has brought with it a great diversity of age at which juveniles commence their careers as economic beings. Opposed to this state of affairs we have the young savage whose future career whether it be as a fighter, fisherman or hunter usually commenced very soon after the onset of the adolescent phase. At the age of fourteen the present-day juvenile is regarded, rather, as a being who still requires care and nurture. Modern civilisation tends at an ever-increasing rate to demand a lengthening of the period of preparation before a career is ultimately embarked upon, and it is now scareely possible for the male adolescent to become economically self-sustaining during his period of adolescence. In the third place, a great social-economic change has taken place during the last fifty years with the result that the vocational prospects of girls are no longer decided by sex, so that we find women in careers which, even twenty years ago, were "reserved for men only." Industrialists now realise that individuality and efficiency are no longer specifically masculine characteristics and that it is for the good of the community that there should be equal opportunities for both sexes.

The conception of specialised aptitudes and the desirability of possessing tests which will indicate, in advance, latent capacity is indeed a very ancient one. In Plato's "Republic", we find mention of this conception and at the same time he regards it as of considerable importance in the conduct of an ideal state. In Book II of the "Republic", we find him leading the dialogue thus:

".....From these considerations, it follows that all things will be produced in superior quantity and quality, and with greater ease, when each man works at a single occupation in accordance with his natural gifts.......Now, is it not of the greatest moment that the work of war should be well done? Willit not also require natural endowments suited to this particular occupation? Then, apparently, it will belong to us to choose out, if we can, that special order of natural endowments which qualifies its possessor for the guardianship of the state."

"Certainly it belongs to us."

"Then, I assure you, we have taken upon ourselves no trifling task."

In order to accomplish this task, Plato proposed that persons, who were being considered for the military profession, should be given "actions to perform" which would t est the retentiveness of their memories, their power to resist deception, of resistance to timidity and fear in terrifying situations, and to the seductions of pleasure. In this way we find Plato forming a battery of tests for military aptitude, but it was not until some 2300 years later that the dream conceived by this Greek genius was realised in the United States Army Mental Tests. What of today? How far have we progressed towards a still greater realisation of Plato's dream?

It was in 1908 that Frank Parsons (1) wrote: "In the wise choice of a vocation there are three broad factors: (a) a clear understanding of yourself, your aptitudes, interests, ambitions, resources, limitations and causes; (b) a knowledge of the requirements and conditions of success, advantages and disadvantages, compensation, opportunities, and prospects in different lines of work; (c) true reasoning on the relation of those groups of facts." Although it is now some thirty years since Parsons made that statement, these three factors still continue to form the basis upon which the vocational psychologist establishes his advice. The vocational psychologist must have, on the one hand, as complete an understanding of the individual as is possible - of his aptitudes, abilities, interests, educational attainments, temperamental characteristics, social encironment, and the like; on the other hand, he needs to be well informed of the requirements and conditions of success which prevail in the various branches of industry, commerce and the professions. He should be able to give the individual, in his search for the most suitable career, some information regarding the various duties which have to be performed in the occupations under survey, the type of machinery generally used, the conditions of work, the rate of pay, the necessary period of training required to be spent before the journey-man status is reached, etc. It should be fairly obvious that the task that is set the vocational psychologist is not an easy one, and that, however intricate individual analysis and occupational analysis may be, the hardest part lies in the effective combination of these two sources of information. It is at this point that his work is invaluable to the community which he seeks, at all times, to serve. In his endeavour to find the most effective combination of these two indispensable sources of information, the psychologists sets himself the task of securing the most adequate adjustment of an individual to an occupation. His recommendations to such an individual about a specific occupation, or group of occupations, must be made <u>only</u> after the most careful comparison of the individual aptitudes, abilities, capacities and temperamental and physical characteristics with those required and demanded by the various occupations. It is of paramount importance for us to realise that sound individual analysis and well-planned occupational analysis must be the essential elements in any scheme of vocational guidance, since those two analyses conjoin to present the picture of 'the right man in the right job'.

Before attempting to discuss in greater detail the three essential phases of vocational guidance, it isnecessary for us to have a clear conception of what the term 'vocational guidance' really means. On the surface, the words 'vocational' and 'guidance' are very commonplace words in the English language, but after a rather lengthy research, however, into the vocational guidance literature of many countries it seems evident to the writer that there does not exist the necessary degree of uniformity regarding the meaning of the term 'vocational guidance'. An excursion into the well-worn pages of a dictionary of repute gave the following lengthy list of synonyms for the word 'guide':- lead, direct, regulate, supervise, manage, superintend, prescribe, control, discipline and assist. Admittedly, there is a sub-stratum of similarity between all of these words and this would lead us to the conclusion that the differences in meaning are due to the numerous uses with which the term 'guidance' is used. Does 'quidance' imply anything of the nature of direction? Does 'guidance' imply anything of a moral or social nature? The answer to these questions is in the affirmative, since it depends on the situation with which one is faced according as to whether one implies direction, supervision, assistance and instruction, or whether anything of the nature of a moral attitude is involved. The most adequate definition of the term 'guidance' would seem, however, to depend on the way the composite term of 'self-guidance' is to be understood and regarded. A. J. Jones(2), an American authority on the subject of vocational guidance, dwells at some length on the various aspects of guidance and he indicates that "the correct interpretation of the term 'guidance' must necessarily involve some measure of 'self-guidance'". Self-guidance involves those strong

strong inner motive forces which control the behaviour of the individual human being and, in order to comprehend fully its psychological significance, a complete understanding of the nature of volition, of the self, and of the instincts is essential. Self-guidance, or guidance involving the self, is an active process and with this in mind we see that 'guidance' be it vocational, educational, physical, or moral must always involve something conative in its constitution. In other words, a person who receives 'guidance' is assisted by some internal agency - the dictates of his will, or by some external agency - the vocational guidance expert, but as often as not both internal and external agencies are at work in shaping his occupational destiny, in fact successful 'guidance' requires the complete co-operation of both. Brewer (3) is of the opinion that the word which seems to harmonise with state of affairs is 'counsel', and he states that "guidance is a form of systematic assistance by which we furnish or help to develop experience, knowledge and wisdom, free from prescription and compulsion, and calculated to lead to self-direction." The word 'counsel' would seem to signify that there is an interchange of opinion between the vocational psychologist and the person who is receiving his counsel. Guidance must, therefore, involve concomitantly both an active and passive attitude, on the one hand, there is the vocational counsellor and the individual who receives his counsel and, on the other hand, there is the individual who expresses his various interests, compulsions, occupational wishes, etc. and the vocational counsellor who endeavours to assess, either quantitatively or qualitatively, these various facts. Guidance, as such, requires the best possible co-operation between both individuals and, unless this is realised, the most adequate meaning of the term 'guidance' is denied us.

We have now to discriminate between the term 'vocational' and its synonyms, a task which is much easier to solve than that set us by its

its sister component 'guidance'. The synonyms given for the word 'vocation' include business, occupation, profession, calling, employment, career, trade and work. Even here there are gradations in meaning but this is not so important as in the former case, since 'vocational guidance' must be inclusive of guidance to a career whether it be profession, trade or occupation. The social and economic which prevail at the present day compel the vocational psychologist to adopt the view-point that vocational guidance, properly understood, has as much to do with careers in farming, engineering, wood-working, plumbing, etc. as with surgery, teaching, law, medicine, etc. Coffin (4) defines 'vocation' as "a social institution which covers <u>all</u> the diversified and organised labour of man." "In the evolution of society", he says, "there comes a time when the increasing number of physical and mental wants of man can no longer be supplied by individual effort, or even by the co-operative effort within the family circle. Division of labour appears and men specialise and co-operate in supplying these needs. One group of men tills the soil, another transports the products of the soil, mine and forest, another mills the grain. Another converts the flour into bread, another merchandises the food products, etc. So there are literally thousands of different differently co-ordinated and mutually dependent occupations. This, then, is what we mean by a vocation : the diversified and organised labour of men." The term 'vocational' must, therefore, include every idea within the compass of its original meaning and every form of labour, however menial, must be incorporated within its range of meaning.

The meaning of the composite term 'vocational guidance' now remains to be discussed. We are well aware of the fact that, if we put two chemical substances in a test-tube, a substance of entirely different characteristics may result, this does not however happen in the following 'equation'. The word 'vocational' plus the word 'guidance' gives us quite naturally 'vocational guidance' and it would appear that the new 'substance' does not differ appreciably from its original 'components'. Vocational guidance occupies a very important position in the study of individual differences and it had as its aim the best possible adjustment of the individual to that section of the industrial world where he will accomplish most for himself and for society. It involves a close study of the intellectual, physical, emotional and environmental factors which affect the daily life of the individual. In recent years the vocational guidance movement has paid considerable attention to the emotional make-up of the individual, since it fully recognises that the affective factor is often the controlling influence in determining his industrial efficiency and happiness. In vocational guidance the individual should be given an insight into his various aptitudes and peculiarities of temperament, he should be informed about the various requirements of vocations and, with the help of his vocational counsellor, he should be initiated into the making of an intelligent occupational choice.

We can now conveniently discuss the first of the three phases of vocational guidance, viz. individual analysis. There are three outstanding assumptions that underlie all modern theory regarding the nature of the individual human being. In the first place, we must regard the juvenile as an active and dynamic being. It took the world many hundreds of years to arrive at the idea that the mind of man is essentially active and cannot be compared to a wax tablet on which words are written with a stylus. In the second place, we must regard every child as an individual. At first thought it would hardly seem necessary, much less important, to lay stress on such an obvious fact. The necessity arises from the fact, to be emphasised later, that he is also social. The child is both individual and social at the same time. Not only must it be recognised that there are these two aspects of the child's life, but it is of the first importance to recognise when we are treating him as one or the other. Again, it is only recently that this two-fold nature of human beings has been realised. The naive assumption is that each person has a separate life of his own, that he is a complete unit in himself. It was but natural, therefore, to think of him as self-contained, growing up within himself, getting his own education, living his own life. But when it comes to understanding and controlling his life and activity, it is very necessary to take into account that he is as truly and constantly social as he is individual. The third assumption we have to make, therefore, is that the child is also social, since his activity can be understood only as other human beings are taken into account. The child is born into an active society. From the very first, therefore, society, through the groups in which he lives, imposes on the child its customs and habits. At any point, then, a child must be thought of not only as being active and individual, but as social, if he is to be understood and directed.

Individual analysis, according to a recent report (5), is either 'empirical' or 'scientific'. The former method, traditional and essentially subjective in character, depends chiefly upon information furnished by the school, by parents, and by the individual himself in arriving at an assessment of his aptitudes, interests, temperament and character. According to Moore (6), "this method of understanding the individual is based on the assumption that a human being is too complex, and his varying capacities and qualities too interrelated, for scientific analysis and isolation ever to be approximated. For that reason it does not pretend to make vocational guidance scientific; the adviser is an artist, not a scientist; the subject is dynamic and plastic, not moulded and plastic;

objective measures are indices and aids, not accurate evaluations of permanent entities; performance, whether they be on form-board tests, mechanical tests or improvised minature jobs, give opportunities to study the subject's behaviour and method of approach, and do not necessarily label the person as good, average, or poor because of the 'time' or 'number of movements' results; questionnaires, rating scales, personality charts are of value in providing hints for the confidential interview, but are of no value when quantitatively treated." Earle (7) regards the 'subjective' method of individual analysis in a similar light, but he does not criticisethe 'objective' method to the same extent as Moore. According to Earle, "the interview, the temperament rating, the questionnaire and the like, are alldevices which may contribute usefully to the final result, and so may form part of the complete psychological examination of the individual. But these devices express only the form and the content, the apparatus and the method, of the enquiry; the interpretation of the result still remains, and it will be apparent that the keener the psychological analysis and the more numerous the aspects of the behaviour of the individual it has embraced, the better is this interpretation likely to be."

Before attempting to convince ourselves of the practicability of the 'subjective' method, let us consider for a moment the claims of the 'objective' or 'scientific' method of individual analysis. Advocates of this method are to be found in Thorndike and Lorge (8). This method is predominantly atomistic in character, aiming at the analysis of the individual into a large number of constituent elements, e.g. intellectual characteristics, innate aptitudes, acquired abilities and attainments, temperament, innate and acquired emotional tendencies, physical characteristics, etc. Fontegne (9) is of the opinion that this is the only satisfactory method of individual analysis and he points out that in the vocational guidance of the individual it is very necessary to determine with the greatest accuracy "his predominant form of attention, how he uses his memory, his reaction type, his manner of making judgments, his capacities in the way of reasoning and imagination, the force, amplitude and duration of movements, his fatigability, educability, etc." Having devised tests which measure the various individual differences, the psychologist is then able to construct a psychograph showing how each ability deviates from the normal, age, sex differences andeducational status being taken into account. A recent report (10) summarises the method thus: "The vocational counsellor", who adopts this method of analysis, "does not profess to guide; he professes merely to orient the individual in an economic world with reference to the best utilisation of his ability. Such orientation involves vocational information, individual testing, placement and follow-up".

Before the present scheme was actually devised, the writer was faced with the rather intricate problem of deciding whether he would adopt the 'scientific' or 'objective' method <u>or</u> the 'clinical' or 'subjective' method of individual analysis. Having used the latter method in the case of boys and girls who attended the University Psychological Clinic for vocational guidance, it was quite evident to him that such a method would be entirely impracticable in a scheme where large numbers of children were involved. He therefore decided that a transition from "the artist to the scientist" must be speedily effected, if vocational guidance was to be given to such a large group. The method of individual analysis ultimately decided was neither strictly 'objective' nor strictly 'subjective' but rather a combination of both with, admittedly, a certain bias towards the 'objective'.

The scheme of individual analysis, as used in this investigation, can be roughly subdivided into four sections:-

(1) Home Report

(2) Medical Examination

(3) School Report

(4) Psychological Examination

Home Report

It was found quite impossible to make visitations to the homes of the children involved in this scheme. This very important aspect of individual analysis was therefore to some extent neglected and does not receive the same consideration as it does in the investigations described by Burt (11) and Earle (12). We must, of course, remember that a special staff was responsible for examining the home conditions of the individuals tested in these investigations and that facilities for this specialised work were not granted to the administrators of this scheme. Information regarding the home circumstances of the individuals involved in this scheme was, of necessity, restricted and was obtained entirely fromthe Home Reports (see pages 71 - 76 : Appendix A). Generally speaking, parents co-operated to the very fullest extent in completing this report and a great deal of valuable information was derived from this source. Table II shows the percentage returns of completed Home Reports.

Table II

	School				Total
	T	B	J.C.	D.K.	
Male Group..............	80.78	83.33	77.18	73.86	79.58
Female Group............	82.96	92.06	83.24	73.82	84.26
Total Group.............	81.89	87.44	80.15	73.84	81.81

We can conveniently consider, at this point, some of the interesting facts derived from an analysis of the Home Reports submitted. Table III shows a classification of fathers' occupations.

Table III

	Boys' fathers	Girls' fathers	Total
Clerical and Highly skilled....	102	91	193
Skilled.....................	241	226	467
Semi-skilled................	243	229	472
Unskilled...................	106	118	224
Unemployed..................	41	58	99
Deceased....................	27	22	49
	760	744	1504

An analysis of the replied to the various questions asked in the Home Report shows the following percentages of affirmative and negative answers.

Boys

	Yes	No
Is your son amenable to discipline?............	70.6%	29.4%
Is he at all excitable?........................	15.8%	84.2%
Is he cheerful?................................	87.3%	12.7%
Is he shy or retiring?.........................	27.0%	73.0%
Is he industrious at home?.....................	61.1%	38.9%
Is he studious?................................	63.4%	36.6%
Is he dependable?..............................	89.5%	10.5%
Does he have any particular hobby?.............	68.7%	31.3%

	Yes	No
Have you ever considered the aptitudes or occupational possibilities of your son?................................	62.8%	37.2%
Is there any need for immediate employment?...........	80.4%	19.6%
Would you allow your son to accept an apprenticeship away from home?..	9.4%	90.6%

rls	Yes	No
Is your daughter amenable to discipline?..............	72.4%	27.6%
Is she at all excitable?................................	29.4%	70.6%
Is she cheerful?..	83.2%	16.8%
Is she shy or retiring?................................	31.0%	69.0%
Is she industrious at home?............................	74.6%	26.4%
Is she studious?..	58.8%	41.2%
Is she dependable?......................................	88.4%	11.6%
Does she have any particular hobby?...................	78.0%	22.0%
Have you ever considered the aptitudes or occupational possibilities of your daughter?.......................	63.7%	36.3%
Is there any need for immediate employment?...........	82.0%	18.0%

It is rather interesting to find, on comparison of these data that, cording to parents' estimates (a) girls are more amenable to discipline,) girls are more excitable, (c) boys are more cheerful, (d) girls are ier and more retiring, (e) girls are more industrious at home, (f) ys are more studious, (g) boys are very slightly more dependable, and) girls have more hobbies.

It is very amusing to look at the wide range of answers to the estion: How does (he or she) get on with the other members of the family?

The following are a few examples:- "Excellently", "Quite well", "O. K.", "Alright", "Quite nicely", "Fairly good", "On the very best of terms", "A. 1.", "Fine", "Very agreeable", "He doesnot get on so well", "Yes", "Not great", etc., etc.

It should also be observed that parents were asked to complete a temperament rating schedule which was incorporated in the Home Report. The data from these estimates has been used to find the degree of correlation between teachers' and parents' estimates of temperament. This will, however, be more fully discussed in Chapter 7.

Medical Examination

The medical examination, the second aspect of individual analysis, is fully explained in Chapter 6, so we shall delay its consideration until then.

School Report

The data required for the third aspect of individual analysis was provided by the School Report (see pages 66 - 70 Appendix A). Table IV shows the percentage returns of School Reports.

Table IV

	School				Total
	T	B	J.C.	D.K.	
Male Group...............	-	100.0	100.0	100.0	64.62
Female Group.............	-	100.0	100.0	100.0	60.13
Total Group..............	-	100.0	100.0	100.0	62.44

It will be seen from the above Table that no School Reports were furnished for the Tynecastle Group.

A temperament rating schedule was also included in the School Report.

The main function of the School Report is to supply the vocational guidance psychologist with information regarding an individual's reaction to an environment which is quite distinct from his home and which most closely approximates to his future occupational environment.

Psychological Examination

As the greater part of this thesis is devoted to the discussion of this fourth aspect of individual analysis, we shall delay its consideration until we come to those chapters which deal with it specifically.

OCCUPATIONAL ANALYSIS

We now come to discuss the second phase of a scheme of vocational guidance, viz. occupational analysis. Warren (13) defines occupational analysis as "a systematic study of all the facts about a specific industrial occupation which have a bearing on selecting or training workers, or improvingmethods of work. Itincludes analysis of the work elements and description of duties, responsibilities, difficulties, working conditions, pay, opportunities for advancement, requisite personal qualities, education and experience, and critical scores in employment tests." Generally speaking, it involves, according to Tead (14), "a scientific study and statement of all the facts about a job which reveal its contents and the modifying factors which surround it." Occupational analysis involves, on the one hand, according to Hackett (15), "a determination of the essential elements in the job", and on the other hand, "a determination of the qualifications a worker should have for its successful performance." It would seem from the above that there are two important aspects in the scientific study of an occupation; first, the 'occupational' aspect, which is a statement of the features of the work, and secondly, the 'human' aspect, which is a description of the mental and physical requirements necessary for its successful performance.

In the survey of the numerous occupationa in Edinburgh we concentrated, mainly, on the human or personal aspect in occupational analysis. A questionnaire (see pages 98 - 100 : Appendix A) was devised and sent to employers and employees in the most important occupations in Edinburgh, who were asked to assess the minimum requirements of a successful worker in their particular sphere. Sixteen traits were listed, namely, linguistic intelligence, practical intelligence, mechanical aptitude, manual dexterity, attainments in English, attainments in arithmetic, colour vision, draughtsmanship, memory, imagination, powers of observation, speed of manual movement, accuracy of manual movement, auditory acuity, visual acuity and physique. Each trait listed in the questionnaire was specifically defined so as to convey the same meaning to independent individuals. Both employers and workers were asked to examine each ability and quality contained in the schedule, and to decide whether it was of negligible importance, whether it was barely significant, whether it was significant, whether it was important, or whether it was essential as a minimum requirement for a successful worker in the occupation in which they were concerned. They were also asked whether their occupation involved prolonged standing or sitting, frequent climbing, frequent use of speech, dry hands, muscular strain, nervous strain, a dusty atmosphere, a damp atmosphere, exposure, heat, cold, indoor work, out-door work, or scaffold work. In addition to the schedule of qualities and abilities, there wasincluded a temperament-rating schedule+in which a number of

+Based on that described by Earle in "Methods of Choosing a Career", p. 328.

traits were required to be rated on a five-point scale. Completed questionnaires were received for sixty-five different occupations; in co-operation with the Ministry of Labour officials, these were examined carefully and 'standardised occupational psychographs' were constructed for the sixty-five occupations. These psychographs are shown in Appendix B, pages 1 - 131.

Certainly these psychographs have their limitations, and critics may say that the various assessments have been based on a subjective analysis of the mental requirements of the occupations in question. Such a criticism is undoubtedly warranted, but until such time as the occupations in this country have been subjected to a systematic objective analysis, the vocational guidance psychologist must be content with the information derived from questionnaires of the nature described.

VOCATIONAL GUIDANCE

We now come to the consideration of the third and most important aspect of a vocational guidance scheme, namely, a thorough understanding of the true relationship of the facts of individual analysis and the facts of occupational analysis. Undeterred by the statement made by Macrae (16) that "the psychologist dreams of the day when, having constructed a silhouette representing the characteristics of the person examined, he will proceed to superimpose this human profile on a number of occupational profiles until he finds one with which it exactly coincides", we have, in this scheme, attempted to base the vocational advice given to the juveniles on somewhat meticulous comparisons made between the individual's psychograph (see pages 104 - 106 : Appendix A) on the one hand and the standardised occupational psychographs on the other hand. A high degree of correspondence between the two profiles gives us a clue to the nature of the first choice of occupation. A second and third choice are, however, also given in the event of the individual's inability to be placed in the work chosen first. These three choices of occupation are never divergent aspects of occupational life but tend, rather, to be characterised by a certain degree of homogeneity.

INTERVIEW

So important is the function of the personal interview in a scheme of vocational guidance that we cannot conclude this chapter without some reference to it. According to Christiaens (17), "If the psychotechnician is observant and has a certain knowledge of people, and especially if he has been wise enough during his life to judge men from their actions rather than from their words, he will easily detect the qualities and defects of the character of the people he is examining merely by following their mimicry and gestures during the test. He must also bear in mind this truth, recognised by all, that from the point of view of work, materially, gesture is the test of thought." This perhaps represents rather an extreme view of the value of the interview and Myers (18) summarises very aptly the function of the interview as it is understood in this investigation. He says that " (1) the interview supplied certain information which, at present, can be adequately obtained in no other way; (2) it affords an idea of the personality of the candidate, his bearing, address and speech; (3) the interview must be carried outwith a clear notion of the factors to be observed; and (4) it requires systematic study of these factors, and better controlled conditions, to increase its serviceability in providing reliable estimates of temperament and character traits of the individual."

Before the three-fold choice of occupation was made, each child was given a personal interview which lasted from five to ten minutes. The duration of this interview is undoubtedly much shorter than one would like, but the conditions of the experiment made it imperative that such a time-limit should be imposed. The suggested choices of occupation were discussed in detail with the child and the order of choice finally determined, this order being influenced to some extent by the child's preference for one of the three occupations under survey. In addition, the writer was able to make a final assessment of the child's temperamental characteristics during the conversation.

It should be noted, at this point, that a perfect coincidence between an individual's psychograph and a particular occupational psychograph did not necessarily signify that such an individual was best fitted for that occupation. For although his mental qualities might correspond exactly with those required for the particular job, yet he might be prevented, either through physical disability or temperamental unsuitability, from following thatjob.

The three-fold choice of occupation was then communicated to the parents on a specialform (see page 103 : Appendix A) which was, in turn, brought up to the Juvenile Employment Office where the officers endeavoured to place the child in accordance with the suggestions of the vocational guidance psychologist.

On March 1st, 1938, 450 juveniles left school and received the vocational information available for them; the remaining 1250 left towards the middle of July, 1938, and in the course of a few weeks the majority were advised on their occupational fitness.

The 'follow-up' is the responsibility of the Ministry of Labour and we eagerly await the results of the first 'follow-up' which is due to take place in July, 1939. The success of such a scheme as this depends obviously on the number of pupils who make good in the jobs which they were advised to take. The experiment, therefore, cannot be judged until it is known (a) how many pupils were actually placed in first-choice jobs, (b) how many in second-choice jobs, (c) how many in third-choice jobs, (d) how many were not placed at all, (e) how many have not been traced, and (f) what steps are being taken to discover (i) the success and (ii) the failures.

It is hoped by this special 'follow-up' action, which it is thought should not take place before the lapse of at least one year, to get reliable information from an adequate sample of 'predicted' as against 'non-predicted' cases. The 'follow-up' will be largely overtaken by the officials of the Ministry of Labour in their Industrial Supervision work, and by means of special visits, as well as from calls that the juveniles, in the ordinary course of business, may make at the Juvenile Employment Office.

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Chapter 3

DESCRIPTION OF TESTS USED IN THE INVESTIGATION

The main purpose of this chapter is to describe the tests which formed the battery of this experimental scheme of vocational guidance. It has to be noted in this connection that none of the tests had any preliminary try-out as constituents of a vocational guidance battery, owing to the fact that facilities for such a try-out would have been rather difficult to obtain. We can, however, regard this experimental investigation as a try-out of a scheme which will, in time, become a permanent feature of the educational system of the area.

(1) The Kuhlmann-Anderson Group Test of Linguistic Intelligence

This test is in booklet form, beginning with Test 26 (the first test for ages 13-14 and the last test for age 10) and concluding with Test 35 (the last test for ages 13-14); there are thus ten tests of the Kuhlmann series (1) included. This test has been extensively used in the Psychology Department, Edinburgh University, for the selection of printing apprentices during the past few years, and new norms for children from 10 to 16 have been constructed. As part of the scheme, the test was administered simultaneously in all four schools in accordance with a pre-arranged time-table which had been drawn up in consultation with the respective Headmasters (see pages 88 - 92, Appendix A). Each teacher responsible for the administration and the correction of the intelligence tests of a class was supplied with a very comprehensive booklet of revised * instructions (see pages 1 - 10, Appendix A) so as to ensure that a correct and uniform testing and scoring technique was employed in all the schools. The time limit allowed for this test was one school period of forty minutes. The class record form on which were recorded the various details of name, chronological age, mental age, intelligence quotient, and rating is shown on page 11, Appendix A.

The procedure adopted in the scoring of the Kuhlmann-Anderson intelligence test is fully described in the booklet of instructions which appears in Appendix A. This procedure is rather long and complicated, since it involves finding the ten mental ages for the raw scores in the ten tests, finding the median mental age from those ten mental ages, and computing the intelligence quotient. Many teachers have stressed the impracticability of this method, chiefly because it is so time-consuming and that it therefore tends to be detrimental to the efficiency of a scheme of vocational guidance. There is, however, a more serious criticism of the original Kuhlmann-Anderson norms to be made, since they give intelligence quotients which are five points higher than they should be. This will be more fully discussed in a later chapter.

Bearing in mind the limitations of the original scoring technique and the slight inaccuracy of the original norms, we have constructed new norms for Scottish children for chronological ages ranging from 10 years 0 months to 15 years 11 months. Instead of having to find the ten mental ages for the ten raw scores and having to compute the median mental age from those ten mental ages, these raw scores have been summated thus giving a total raw score for the test as a whole. These total raw scores have been standardised in the usual way and are easily convertible into intelligence quotients.

*There were many "Americanisms" in the original instructions and these have been omitted in the revised instructions.

(2) Individual Tests of Practical Intelligence.

The battery of tests of practical intelligence consisted of the Oakley Formboard, the Kon's Block Design Test, and the Cube Construction Test. Owing to the fact that no satisfactory group test of practical intelligence has yet been evolved, we were set the rather intricate problem of having to devise a means whereby a large number of children could be tested individually within as short a time as possible. It was ultimately decided that the Edinburgh Education Committee should make itself responsible for the construction of twenty sets of each test. Volunteer student testers were then recruited from the First Ordinary Psychology Class, and they were specially instructed in the methods of testing to be adopted and, in addition to receiving practical instruction, they were each supplied with a set of mimeographed instructions (see pages 12 - 18, Appendix A). In order to secure an adequate supply of trained students for the various school periods, time-tables were drawn up showing the times at which they were expected to be present (see pages 84 - 87, Appendix A). Within the time limit of one school period each student made himself/herself responsible for the testing of a pupil with all the tests of the battery. Half-classes were taken at a time, so that during any one period twenty students were testing twenty pupils; in an eight-period day we were thus able to test 160 pupils. The timing of the tests for such a large group was made possible by the use of a large clock with second hands. After a class had entered the room and the various details of name, age and class had been noted down by the students on the special forms provided for the purpose (see pages 19 - 21, Appendix A), the students were then told that they could start timing the tests on the pre-arranged signal from the supervisor, who clocked up each minute, as it passed, on the blackboard. In this way the students were able to time the tests very accurately in minutes and seconds; thismethod did away with the necessity of providing them with stop-watches.

The first test in the scale is that devised by Oakley (2) and known as the Oakley Formboard Test. It is rather a complex formboard and is shown in diagrammatic form on page 14, Appendix A. The various sections are coloured and not infreuqnetly the test reveals colour blindness if present. Before the test is begun the blocks, which are one inch thick and coloured on all sides, are placed on their edges at the top of the formboard in the order shown in the upper part of the diagram. The holes in the formboard are half an inch deep and their bases are coloured. There are six sections in the formboard, the first (white section) being used for practice. According to Oakley, "each section has been so devised as to provide for observation", but the conditions of the experiment made it impossible for any of the students to make observations on the methods used by the subjects in tackling the various sections. The subject's performance in the test, irrespective of whether he attempted to plan ahead or whether he was slap-dash, was the most important aspect for our particular purpose. In an individual scheme of vocational guidance it should be however noted that this particular test affords the vocational psychologist an excellent opportunity of observing the methods used by the subjects in approaching practical problems. One can, for example, observe what consideration appears to be given to the problem before commencing; any re-arrangements of the blocks prior to commencing; the comparative speeds at commencing and finishing; the methods of dealing with the blocks which have been lifted but which have not been correctly inserted; the degree of certainty with which the blocks are inserted; and we can also observe whether the subject plans his work or whether his method of attack is slap-dash. This test, in common with other formboard tests, gives us valuable insight as to whether the subject is aggressive or not. We can, for example, observe whether the subject forces the blocks into position or whether he places them gently into position. Another aspect of the subject's mental make-up may be observed from his response to the instructions given him. It will be noted that in this particular test the subject is asked to complete the sections in a particular order, viz. white, blue, black, red, green and yellow. In spite of these instructions quite a number of individuals, on the completion of the black section, go on to the yellow. We can, therefore, infer these individuals are contra-suggestible.

As part of the performance scale used in this investigation, the Oakley Formboard Test was scored in the following way. Each subject was allowed a maximum of six minutes for the completion of the test from the blue sections to the green section. Subjects who completed the various sections within the specified time-limit of 360 secs were assessed in the following way:-

(a) <u>five points</u> to those individuals who have successfully completed the blue sections within the time-limit.

(b) <u>fifteen points</u> to those individuals who have successfully completed the blue sections and the black section within the time-limit.

(c) <u>thirty points</u> to those individuals who have successfully completed the blue sections, the black section and the red section within the time-limit.

(d) <u>fifty points</u> to those individuals who have successfully completed the blue sections, the black section, the red section and the green section within the time-limit of 360 secs.

In order to take the time factor into consideration, the subject's performance in the test was assessed in terms of an efficiency score. This efficiency score expressed the ratio of the number of points scored to half the time taken. For example, if an individual successfully completed up to the green section in 300 seconds, his efficiency score would be:-

$$\underline{\text{Efficiency Score}} = \frac{50}{150} \times 100 = \underline{33}$$

If an individual successfully completes the yellow section, as well as the others, he is awarded 20 points which are added to his efficiency score. For example, if he completes all the sections up to and including the green in 200 seconds and completes the yellow section within the maximum time-limit of 360 seconds, his score in the test will be:-

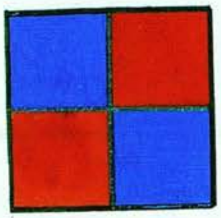
$$\underline{\text{Efficiency Score}} = \frac{50}{100} \times 100 = \underline{50}$$

Add to this efficiency score the 20 points for completing the yellow section, his score in the test is then 70. In calculating the efficiency scores of those individuals who only complete (a) the blue sections, (b) the blue sections and the black section, and (c) the blue sections, the black section and the red section, the denominator is always taken as 180, i.e. half the maximum time-limit of 360 seconds.

The second test in the performance scale is that devised by Kohs (3). This Block Design Test makes use of sixteen inch cubes which have their sides painted in a certain way. Each cube has one red side, one blue, one white, and one yellow side; while one of the remaining sides is blue and yellow diagonally divided, the other being red and white diagonally divided. Various coloured designs, increasing in difficulty from the first to the tenth, can be made with these coloured cubes. The first five designs require only four cubes, the sixth and seventh designs require nine cubes, while the eighth, ninth and tenth designs require all sixteen cubes for their construction. Cards with the various designs painted upon them are placed in front of the subject and these act as guides in the construction of the required design. The various designs used in this scale are shown on the next page.

The method of administration is exactly the same as that used by Collins

THE TEST MATERIAL



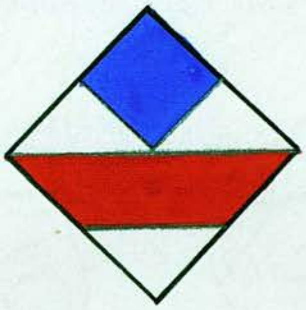
(1)

(2)

(3)

(4)

(6)



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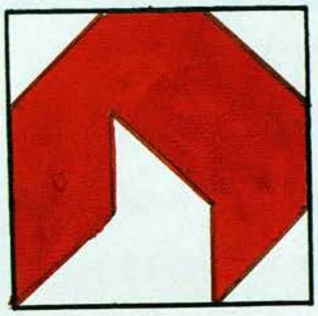

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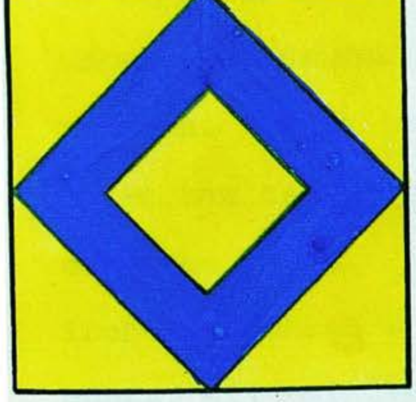

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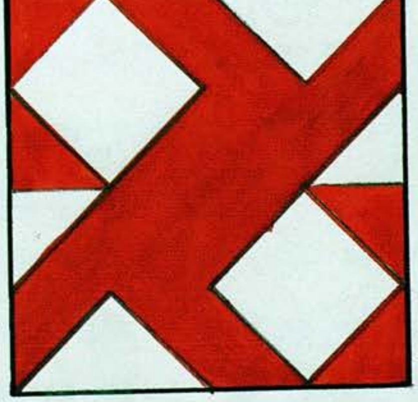

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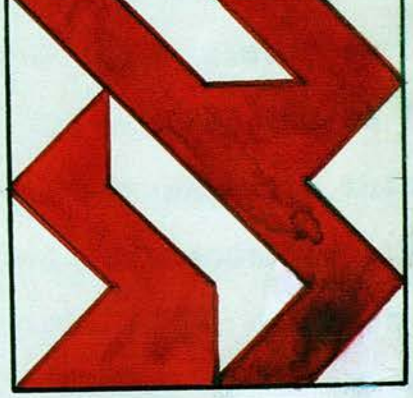

(10)

and Drever (4) in their scale of performance tests. The timing for the various designs is, however, a little different, and Table I shows how the time factor differs in the two scales. The scoring of this test is the same as that used in the Collins and Drever Scale.

Table 1

	Design										Total
	1	2	3	4	5	6	7	8	9	10	
Collins and Drever Scale	$1\frac{1}{2}$	$1\frac{1}{2}$	2	2	2	3	3	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$25\frac{1}{2}$ mins.
Vocational Guidance Scale	1	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$	2	2	3	3	3	19 mins.

The third test in the performance scale is the Cube Construction test described by Gaw (5) and also by Collins and Drever. The test is in three parts. In the first part, the subject is asked to construct the middle section of a three-inch cube painted grey on the outside. This section, painted grey on the sides, is shown to the subject, and he isgiven the necessary nine one-inch cubes, suitably painted, with which to copy the model. In the second part of the test, the subject is asked to construct the top section of a three-inch cube painted on the outside. This section, as before, is shown to the subject and he is given the necessary nine one-inch cubes, suitably painted, with whichto copy the model. In the third section of the test, the model is a two-inch cube which is unpainted. The subject is given eight one-inch cubes, all painted grey on three adjacent surfaces, with which to copy the model.

The method of administration is exactly the same as that used by

Collins and Drever, but again the timing of the test is a little different. In the scale used in the investigation, <u>three and a half</u> minutes are allowed for the first and for the second parts of the test, and <u>five</u> minutes are allowed for the third part. So that instead of requiring a maximum of 15 minutes, as in the Collins and Drever scale, this test requires a maximum of 12 minutes. The scoring of the test is the same as that used in the original form of the Collins and Drever scale, viz. <u>five</u> points for the first part of the test, <u>nine</u> points for the second part, and <u>sixteen</u> points for the third part.

The performance scale, as used in this investigation, requires a maximum time-limit of <u>thirty-seven</u> minutes, as shown in Table II.

<u>Table II</u>

Test	Time
Oakley Formboard Test	6 mins.
Koh's Block Design Test	19 mins.
Cube Construction Test	12 mins.
Total Time	37 mins.

Norms, in the form of intelligence quotients, have been prepared for this battery of tests for chronological ages ranging from 13 years 0 months to 14 years 11 months, for both boys and girls (see pages Appendix A). The total raw scores, which have been standardised, are obtained by adding together the efficiency score obtained in the Oakley Formboard Test, <u>twice</u> the score obtained in the Koh's Block Design Test, and the score obtained in the Cube Construction Test. The individual tests of the battery are, therefore, not separately standardised.

(3) Group Test of Manual Dexterity.

While one half of a class was being tested with the practical intelligence tests, the other half was being tested with the manual dexterity tests. On the termination of the school period (40. mins.) the half classes were switched over, and in this way a whole class could be tested for practical intelligence and manual dexterity in eighty minutes. The tests composing the manual dexterity battery were the assembling of nuts and bolts test, the dissembling of nuts and bolts test, and the pegboard test.

As in the case of the test material for the individual tests of practical intelligence, there were twenty sets of material, each pupil being supplied with one set of nuts and bolts (10 of each in a box), one pegboard, and a box of pegs (100 pegs in a box). This test was administered by two members of the school staff who had been specially instructed in the testing technique (see pages 44 - 48, Appendix A).

The method employed in the actual testing may be of some interest. The dissembling and assembling tests, administered in group form, were given alternately, so that the one logically followed on the other. Three trials (1 min. each) were given for each test, the order being D, A, D, A, D, A, D, A, and the median score obtained in each test was taken and entered on the class record-form drawn up for the purpose (see page 49, Appendix A). The pegboard test was also given three times, the median score being taken, i.e. number of pegs inserted in the pegboard in two minutes. Summing the three median scores, we arrived at a raw score for manual dexterity, which was converted into a standardised score, which in turn was rated on a 15-point scale. The norms for the manual dexterity test are shown on pages 120 - 121 of Appendix A.

One teacher made himself responsible for the actual timing of the tests and the entering up of the information on the class record forms, while his colleague went round the pupils assessing their output in the various tests within the prescribed time-limits. In the dissembling test, a pupil scored 3 points for every completely dissembled unit (nut, washer, and bolt), 2 points for a bolt which had had the nut removed from it, but on which the washer still remained, and 1 point for a bolt on which the washer still remained, but which had had the nut unscrewed past the half-way mark on the bolt threading. With ten units, the highest possible score was 30 points. In the assembling test, a pupil scored 3 points for every completely assembled unit; 2 points for a bolt on which the washer and nut had been placed, but the nut was only half-way up the bolt threading, and 1 point for a bolt on which the washer but not the nut had been placed. Again the highest possible score was 30 points. In the pegboard test one point was allowed for every peg inserted in the board. The highest possible raw score for the group manual dexterity test was 160 points.

(4) Cox's Group Test of Mechanical Aptitude

This test was administered and scored by the teaching staff in the various schools who had previously received practical instruction in the testing technique (see pages 22 - 31, Appendix A). Cox's (6) tests of mechanical aptitude are of the pencil and paper type and must be clearly differentiated from the mechanical assembling tests as used by Stenquist(7). The test, as used in this investigation, consisted of two sub-tests, Test I and Test II. Each test consisted of five wooden models which were used by the teachers for demonstration purposes and were never actually handled by the pupils. Each pupil was supplied with two booklets of mechanical diagrams, one for Test I and the other for Test II, as well as an answer form (see pages 32 - 42, Appendix A). The procedure adopted in the administration of this test is shown in Appendix A.

Four sets of the models required for this group test were purchased by the Education Committee, and in this way four classes could be tested simultaneously for mechanical aptitude. The test had previously been used in an investigation (8) carried out in the Edinburgh Schools concerning the measurement of the 'm' factor before the age of 12, and with the additional information obtained from the results in this scheme, standardised scores have been constructed for chronological ages ranging from 10 years 0 months to 15 years 11 months, in the case of boys, and from 12 years 6 months to 15 years 5 months, in the case of girls. A time-limit of forty minutes was allowed for this test, and in a school which had twenty classes involved in the scheme (approximately 800 pupils), five periods (3 hours 20 minutes) were required, in which to test that number. The norms for this test are shown on pages 111-119, Appendix A.

(5) Attainment Tests in English and Arithmetic.

The inclusion of Burt's Northumberland English and Arithmetic tests (9) had been originally planned, but owing to the considerable expense which would have been entailed by the purchase of sufficient booklets to cover the number of pupils involved in the scheme, it was found necessary to devise a special attainment test in English and another in Arithmetic. These tests were ultimately constructed and are known as the George Combe Standardised Tests (copies are to be found at the back of the thesis), both tests being in booklet form and each containing seven tests. They have been standardised for chronological ages of 13 years 0 months to 14 years 11 months, and have the additional advantage over the Northumberland Tests of being much more easily scored and taking only 35 minutes to administer. The teachers in the various schools were responsible for giving the tests, each teacher being supplied with directions for administration and scoring.

The norms for this test are shown on pages 122 123, Appendix A, while the directions for the administration and scoring of the test are shown on pages 50 - 59 of Appendix A.

(6) Test of Colour Blindness

The Ishihara (10) test of colour blindness was also included in this battery of tests, but was confined to boys. The test was included because in Edinburgh there are many occupations for which normal colour vision is essential. As this scheme was conducted during the months when artificial lighting is extensively used in the schools, an electric torch fitted with a daylight bulb was used to illustrate the various figures in the test. Four boys were tested at a time and were told to write down, on aspecial form devised for the purpose (see page 64, Appendix A), what they saw on the various pages. It was found that forty boys could quite easily be tested in the period of forty minutes. A five-point rating was used to classify the boys for colour vision: rating A for those who read the figures correctly and without hesitation, rating B for those who read the figures for the most part correctly and without hesitation, rating C for those who read the figures with much hesitation and with frequent errors, but whose colour defect did not amount to anomalous trichromatism, rating D for those who had anomalous red-green vision, and rating E for those who were totally red-green colour blind. The colour vision ratings of a class were noted on the form shown on page 65, Appendix A.

(7) 'Choice of Occupation' Questionnaire.

A 'choice of occupation' questionnaire (see pages 79 - 83, Appendix A) to the class at the same time as the colour blindness test. This questionnaire is a four-page booklet. The first page contains three questions, namely: (1) State the profession, trade, or occupation which you intend to follow, and give roughly your age when you made this decision. (2) State, as carefully as possible, the reasons why you have made this particular choice, and show what persons or what reasons have influenced you most. (3) If you have not yet decided what you intend to be, state what occupation you would like to adopt and give the reasons why.

The second and third pages contain a list of some 300 occupations, and the pupils are asked to put an X opposite any of the occupations at which they would like to work, while the fourth page contains a list of eighteen reasons for the choice of an occupation. The pupils are asked on this page to put a "1" opposite the reason which has been strongest in determining their choice of occupation, a "2" opposite the second most powerful reason or influence, and so on. In the case of the girls, this questionnaire was completed under the supervision of the class-teacher.

In addition to the above battery of tests, special home, school, and medical reports were used (see pages 66 - 78, Appendix A). A novel feature of the home and school reports was the inclusion, in each, of a temperament-rating schedule similar to that used by Earle (11) in the second London experiment of the N.I.I.P. Standardised definitions of the various traits used in the schedule were supplied in each home report and to each teacher responsible for the filling in of the school reports of a class.

The standardised scores obtained in the various tests were entered up on an individual psychograph (see pages 104 - 106, Appendix A) for each pupil, together with other relevant information from the home, school and medical reports, while the occupational suggestions arrived at, as a result of their being psychologically tested, were communicated to the parents on the form shown on page 103 of Appendix A.

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Chapter 4

STATISTICAL TREATMENT OF DATA

(1) Analysis of single distributions

In accordance with the usual statistical practice, frequency distributions of tests scores, both raw and standardised, have been classified according to the nature of their moments and other descriptive parameters. The great variability in the results of scientific observations makes single measurements very unreliable, so that some method must be adopted to give those measurements the required degree of statistical reliability and exactness. In statistics, we have a method by which a large number of individual measurements can be grouped together into a single representative measurement. This method gives us a value which represents the centre about which the individual measurements are distributed, and this value has thus been called "the measure of central tendency". The measures of central tendency used in this investigation are two in number, viz. the mean and the median.

The mean is obtained by adding together the individual measurements and then dividing this sum by the total number of cases.

$$\text{Mean} = \frac{\sum M}{N} \text{ ....(1)}$$

where $\sum M$ = the sum of the individual measurements

N = the total number of cases

The mean is one of the most frequently used measures of central tendency, and it has the advantage of giving each individual measurement in a distribution its required weight. Though it is the most frequently used measure of central tendency, it is not always the most representative measure, since the presence of a few very large individual measurements at either end of the distribution will alter the value of the mean quite appreciably. The mean is, therefore, used to the best advantage as a measure of central tendency when one has to deal with large distributions in which isolated individual measurements do not receive excessive weight.

The median is obtained by arranging, in ascending or descending order of magnitude, the individual measurements and then selecting the particular value on either side of which 50% of the total number of measurements lie. When there is an even number of total cases, the median is to be found midway between the two middle measures, when the series is arranged in ascending or descending order of magnitude. When, however, the median of a very large distribution is required, the above method is not very practical and the following formula is used instead:-

$$Q_2 = L + \frac{N/2 - f_1}{f_m} \times C \text{ ....(2)}$$

where Q_2 = the median or middle quartile

N = the total frequency

L = the lower limit of the class-interval in which the median lies

C = the range of that class-interval

f_m = the frequency in this interval

f_1 = the frequency below it

The median, since it is based on position in a distribution rather than on the magnitude of the individual measurements which compose the distribution, is a much more representative measure of central tendency for small distributions. In large distributions, however, the mean and median approximate very closely to one another and in the normal frequency distribution they are identical in value.

Having obtained measures of central tendency which are representative of the distribution in so far as the individual measurements approach them, we have now to consider the measures of dispersion or spread. In a frequency distribution we may find that the individual measurements are widely scattered about the measure of central tendency and, on the other hand, they may be narrowly scattered. In order to determine the degree of dispersion of the individual measurements, three statistical measures of dispersion have been used in this investigation, they are the standard deviation, probable error and semi-interquartile range.

The standard deviation is the measure of dispersion which is most frequently used in statistical practice of a psychological nature. The standard deviation (σ) is defined to be the square root of the mean of the squared deviations from the mean, and it is computed from the following formula:-

$$\sigma - \sqrt{\frac{\Sigma ax^2}{N} - \left(\frac{\Sigma ax}{N}\right)^2} \text{ X } C \quad \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

where O = the standard deviation

C = the class-interval

Σax^2 = the sum of the squared deviations from the mean

Σax = the sum of the deviations from the mean, the positive and negative signs being taken into account

N = total frequency

The probable error, as a measure of dispersion, is of the utmost importance and is of considerable statistical significance because 50% of all the individual measurements in a frequency distribution lie within the range represented by measuring off one P.E. on either side of the measure of central tendency. The probable error, as we shall see later, is also used in calculating significance ratios. The P.E. is obtained from the following equation:-

$$P.E. = .6745\,\sigma \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The third of the measures of dispersion used in this investigation is the <u>semi-interquartile</u> range. In the normal curve of frequency the median ordinate halves the distribution, halving again the two parts of the distribution we obtain values which are called the "quartile measures". The lower quartile (Q_1) is the middle variate of the lower half of the distribution and the upper quartile (Q_3) is the middle variate of the upper half. The upper and lower quartiles are calculated from formula (2), but instead of the factor N/2, N/4 is substituted when computing the lower quartile and 3N/4 when computing the upper quartile. In the normal frequency distribution, therefore, the quartiles and median divide the distribution into four groups of equal frequency and the measure of dispersion derived from those quartiles measures is known as the "semi-interquartile range. This is calculated from the following formula:-

$$Q = \frac{Q_3 - Q_1}{2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where Q = the semi-interquartile range

Q_3 = the upper quartile

Q_1 = the lower quartile

In the normal curve of frequency, the semi-interquartile range includes 25% of the individual measurements in either direction from the measure of central tendency.

The measures of central tendency and measure of dispersion canbe represented graphically for the normal frequency curve, as follows:-

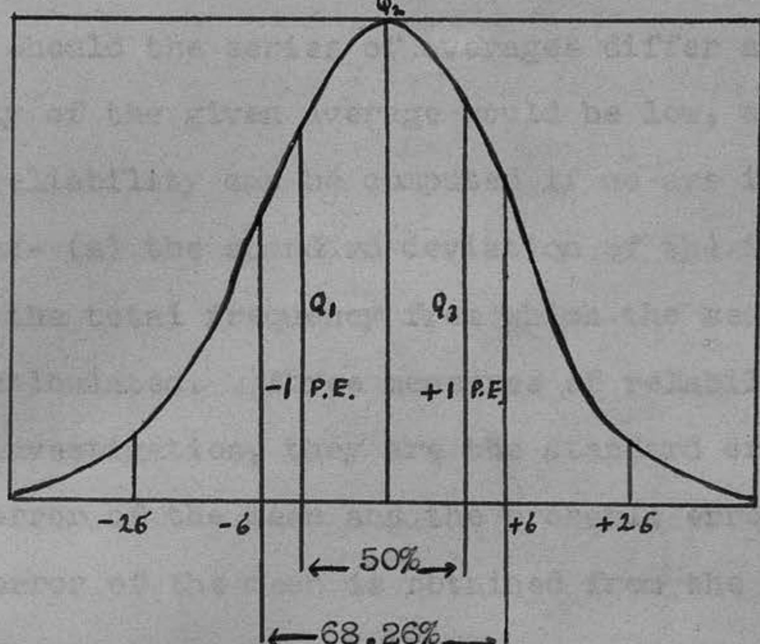

Fig. 1

It will be noted that in Fig. 1 the range of dispersion represented by the standard deviation ($\pm\sigma$) isthe largest and that if a range bounded by $+3\sigma$ and -3σ be taken then more than 99% of the individual measurements lie within this range. The range represented by the probable error is the smallest, since only 50% of the total number of individual measurements lie within the range bounded by +1 P.E. and -1 P.E.

We now come to consider the question of the reliability of the measures of central tendency. It has been shown that measures of dispersion for a distribution give us an indication of the extent to which indivisual measurements deviate from the measure of central tendency. Measurements of reliability, on the other hand, give us an indication of the degree to which the measure of central tendency itself is liable to alter if an absolutely new sample of measurements is taken. A measure of reliability, therefore, gives us a prediction of the degree of variability of a number of averages of successive distributions , distributions which have been obtained under similar conditions. Should the series of averages differ appreciably, then the reliability of the given average would be low, and vice-versa. A measure of reliability can be computed if we are in possession of the following data:- (a) the standard deviation of the individual measurements and (b) the total frequency from which the measure of central tendency was calculated. Three measures of reliability have been used in this investigation, they are the standard error of the mean, the probable error of the mean and the probable error of the median. The standard error of the mean is obtained from the following formula:-

$$\sigma_m = \frac{\sigma'}{\sqrt{N}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

where σ_m = the standard error of the mean

σ' = the standard deviation of the distribution

N = the total frequency

The formula for the second measure of reliability, viz. the probable error of the mean, is as follows:-

$$P.E._m = \frac{P.E.'}{\sqrt{N}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

where $P.E._m$ = the probable error of the mean

$P.E.'$ = the probable error of the distribution

N = the total number of cases in the sample

The <u>probable error of the median</u> is given by the following formula:-

$$P.E._M = \frac{5\ P.E.'}{4\sqrt{N}} \quad \text{.........................(8)}$$

where $P.E._M$ = the probable error of the median

$P.E.'$ = the probable error of the distribution

N = the total number of cases in the sample

It will be noticed from the above that the reliability of any measures of central tendency increases, not in proportion to the number of cases, but to the square root of the number of cases.

It is frequently necessary to determine whether the observed difference between two measures of central tendency of different frequency distributions is statistically significant or merely due to some chance factor. This problem reduces itself to one of finding either the standard error or the probable error of the difference between two measures of central tendency. Suppose we wish to find the standard error of the difference between two means. Let σ_{m_1} be the standard error of the mean of one of the frequency distributions and let σ_{m_2} be the standard error of the other. Let σ_d be the standard error of the difference. Then we have:-

$$\sigma_d = \sqrt{(\sigma_{m_1})^2 + (\sigma_{m_2})^2} \quad \text{...............(9)}$$

If we denote the means of the frequency distributions by m_1 and m_2, then the observed difference between the two means is given by:-

$$D = m_1 - m_2 \quad \text{.....................(10)}$$

In order to determine the degree of significance of the difference between the two means, the following formula is used:-

$$\frac{D}{\sigma_d} = \text{ or } > 3 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

For statistical purposes it has been agreed that, in order to be significant, the difference between two means must exceed the standard error by a large enough ratio to ensure that the chances are approximately 100 in a 100 that the direction of the difference will be confirmed. So that unless the ratio of the observed difference between the means to the standard error of the difference is equal to or greater than 3, it is not usual to rely on the difference as being significant. A similar procedure can be adopted if the probable error of the difference of two means isrequired. The formula which is used is as follows:-

$$P.E._d = \sqrt{(P.E._{m_1})^2 - (P.E._{m_2})^2} \quad \ldots\ldots\ldots\ldots (12)$$

where $P.E._d$ = the probable error of the difference

$P.E._{m_1}$ = the probable error of the mean (m_1)

$P.E._{m_2}$ = the probable error of the mean (m_2)

Using formula (10), we can now determine the degree of significance of the difference between the two means by the following formula:-

$$\frac{D}{P.E._d} = \text{ or } > 4 \quad \ldots\ldots\ldots\ldots\ldots\ldots (13)$$

It is to be noted that when we apply formulae (9) and (12) the two frequency distributions must be <u>uncorrelated</u>. When the two distributions are correlated the following formulae are used:-

$$\sigma_d = \sqrt{(\sigma_{m_1})^2 + (\sigma_{m_2})^2 - 2\, r\, \sigma_{m_1} \sigma_{m_2}} \quad \ldots\ldots (14)$$

$$P.E._d = \sqrt{(P.E._{m_1})^2 + (P.E._{m_2})^2 - 2\,r\,P.E._{m_1}\,P.E._{m_2}} \quad \ldots(15)$$

where r is the coefficient of correlation between the two distributions.

In recent times great importance has been attached to the moments about the mean of a distribution, when the mean is taken as origin. The equations which express the values of these moments about the mean are as follows:-

$$\mu_1 = 0 \quad \ldots\ldots(16)$$

$$\mu_2 = m_2 - m_1^2 - .08 \quad \ldots\ldots(17)$$

$$\mu_3 = m_3 - 3m_1m_2 + 2m_1^2 \quad \ldots\ldots(18)$$

$$\mu_4 = m_4 - 4m_1m_3 + 6m_1^2m_2 - 3m_1^4 \quad \ldots\ldots(19)$$

It is to be noted that the factor .08 appears in equation (17). This value is known as "Shepherd's correction", and it isinserted in this equation for the following reason. When a continuous distribution is grouped into class intervals, the moments derived from such a classified distribution require adjustment as a result of this grouping, so "Shepherd's correction" is inserted to give the necessary adjustment. The standard deviation can be obtained from equation (17), since μ_2 gives the variance of a distribution, thus:-

$$\sigma = \sqrt{\mu_2} \quad \ldots\ldots(20)$$

Measures of Asymmetry or Skewness.

The question of skewness or asymmetry has now to be discussed. Frequency distributions besides requiring measures of central tendency, measures of dispersion and measures of reliability, also require measures of skewness, if the true significance of the distribution is to be fully relaised. When one comes to examine distributionsof mental ages, distributions of scores in the mechanical aptitude test, etc., we realise that measures of skewness are of inestimable value in determining for us the degree of difficulty of a test and assisting us towards a better and more valid explanation of its presence in the distribution. Many measures of skewness have been devised, but the one which has the greatest statistical utility is that devised by Pearson (1), viz. 'Pearson's β_1'. This absolute measure of skewness is derived from the third moment about the mean (μ_3), thus:-

$$\beta_1 = \frac{\mu_3}{\sigma^3} = \frac{u_3}{u_2^{3/2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (21)$$

If $\beta_1 < 0$, then a distribution has negative skewness, and if $\beta_1 > 0$, the distribution has positive skewness; the value of β_1 for the normal curve of frequency is, of course, zero. If it is found that skewness is present in a distribution of scores for a large sample of the population, this is a phenomenon of psychological importance. For, if the "long tail" of the distribution lies towards the large values of the variate, the distribution is positively skew, and this would indicate that the test is too difficult for the individuals of the age-group being tested; if, on the other hand, the "long tail" of the distribution lies towards the small values of the variate, the distribution is negatively skew, and this would indicate that the test is too easy for the age-group being tested. Skewness can, of course, be induced owing to the fact that small samples of the population have been tested, but this type of skewness can be obviated by testing as large samples as possible. Another measure of skewness which has been used in the statistical treatment of data is given by the following formula:-

$$\text{Skewness} = \frac{3\ (\text{Mean} - \text{Median})}{\text{Standard deviation}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (22)$$

In order to determine whether this measure of skewness is significant, it is necessary to find its probable error and apply the test described on page . The probable error of this measure of skewness is given by:-

$$P.E._s = .6745 \sqrt{\frac{3}{2N}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (23)$$

The initial stages of an analysis of a frequency distribution almost always involve the computation of moments. The scheme of computation is simplest for discrete variates at equidistant intervals, and it is customary to break up a continuous distribution into classes of usually some twelve or fifteen intervals. The procedure adopted in the statistical analysis of the frequency distributions obtained in this investigation is shown below:-

Table I

Mental Ages	Frequency	Cumulative Frequency	a	af	$a^2 f$	$a^3 f$
220 - 229	4	587	6	24	144	864
210 - 219	7	583	5	35	175	875
200 - 209	7	576	4	28	112	448
190 - 199	34	569	3	102	306	918
180 - 189	68	535	2	136	272	544
170 - 179	73	467	1	73	73	73
160 - 169	130	394	0	0	0	0
150 - 159	110	264	-1	-110	110	-110
140 - 149	87	154	-2	-174	378	-696
130 - 139	50	67	-3	-150	450	-1350
120 - 129	13	17	-4	-52	208	-832
110 - 119	3	4	-5	-15	75	-375
100 - 109	1	1	-6	-6	36	-216
	587			-109	2309	143

$$m_1 = -\frac{109}{587} = -.1857$$

$$m_2 = \frac{2309}{587} = 3.933$$

$$m_3 = \frac{143}{587} = .2436$$

Having obtained m_1, m_2, and m_3, the moments of the frequency distribution, we can now compute the required parameters.

(a) Mean

Relative frequency $\bar{x} = -\frac{109}{587} = -.1857 \text{ X } 10 = 1.857$

(10 is the class-interval)

Mean = 164.500 - 1.857 = 162.643

(b) Median

Using formula (2), we have:-

$$159.5 + \frac{293.5 - 264}{130} \text{ X } 10$$

Median = 161.769.

(c) Upper quartile

$$169.5 + \frac{440.25 - 394}{73} \text{ X } 10$$

Upper quartile = 175.836

(d) Lower quartile

$$139.5 + \frac{146.75 - 67}{87} \text{ X } 10$$

Lower quartile = 148.669

(e) Semi-interquartile range: Using formula (5) we have:-

$$\text{S. I. R.} = \frac{175.836 - 148.669}{2}$$

$$= \underline{13.584.}$$

(f) Standard deviation: Using formula (3) we have:-

$$\text{S.D.} = \frac{2309}{587} - (.186) - .083$$

$$= 3.826$$

$$\text{S.D.} = 1.9544 \times 10 \text{ (class-interval)}$$

$$= \underline{19.544}$$

(g) Probable error (mean): Using formula (7) we have:-

$$\text{P.E.}_{(m)} = \frac{.6745 \times 19.544}{587}$$

$$= \underline{\pm.544}$$

(h) Probable error (median) : Using formula (8) we have:-

$$\text{P.E.}_{(M)} = \frac{5 \times .6745 \times 19.544}{4 \quad 587}$$

$$= \underline{\pm.680}$$

(i) Measure of skewness ($_1$): Using formulae $\frac{(18)}{(21)}$ we have:-

$$_1 = \frac{.2436 - 3(-.1857)(3.933) + 2(-.1857)}{7.461}$$

$$= \underline{\pm.3254}$$

(2) Computation of correlation coefficients

Besides having to compute measures of central tendency, measures of dispersion, measures of reliability, etc. for frequency distributions, it is often very essential to determine the extent to which two frequency distributions are related. In order to ascertain this relationship it is necessary to make ourselves familiar with the statistical concept of 'correlation'. A 'correlation coefficient' may be defined as a measure of the relationship which exists between two sets of variates. In order to express this relationship in terms of a single value, it is necessary to employ either Pearson's product-moment coefficient of correlation ('r') or the rank difference coefficient of correlation ('o') devised by Spearman. The Pearsonian coefficient of correlation is used when differences in the absolute magnitude of individual measurements are compared and when the total frequency of the two distributions being compared is fairly large. On the other hand, the Spearman rank difference is used when the total frequency is relatively small and when the differences in rank between the paired measurements are the all-important factors.

The Pearsonian coefficients of correlation have been computed in this investigation by the method devised by Dr. A. C. Aitken of the Mathematical Department of Edinburgh University. The method consists in computing the mean value of the product $1/N \sum xy$, according to the contributions made to it by the rows and columns of a correlation matrix. Thus in the i^{th} row for $y = y_i$ constant for the row, we compute $\sum f_j x_j$, i.e. multiply each cell element by the corresponding

MATRIX USED IN THE CALCULATION OF THE PEARSONIAN COEFFICIENT OF CORRELATION (AITKEN'S METHOD)

English

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	f	x	fx	fx^2	Σy	$y\Sigma x$
A+											1	1		1	2	5	7	35	245	27	189
A									1			1		2	2	6	6	36	216	31	186
A-										3	1	4	2		1	11	5	55	275	42	210
B+						1	3		3	3	7	8	1	3	·	29	4	116	464	80	320
B				2	1	2	3	4	10	5	7	12	5	3	1	55	3	165	495	121	363
B-			1	1	3	3	10	15	13	15	8	9	11	5	1	95	2	190	380	161	322
C+	1	1		1	3	6	19	25	20	19	16	6	3	3		123	1	123	123	106	106
C		3	3	4	14	23	21	29	28	12	10	5	3	2		157	0	·	·	-29	·
C-	1	2	1	11	11	25	31	22	24	11	6	1		1		147	-1	-147	147	-108	108
D+	3		4	11	15	17	21	21	9	5	2					108	-2	-216	432	-160	320
D	3	5	3	3	11	11	10	13	5							64	-3	-192	576	-138	414
D-	3	2	5	3	1		1	1								16	-4	-64	256	-74	296
E+	1			2	2											5	-5	-25	125	-21	105
E	1															1	-6	-6	36	-7	42
E-																·	-7	·	·	·	·
f	13	13	17	38	61	88	119	130	113	73	58	47	25	20	7	822		+70	3770	+31	2981
x	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7						
fx	-91	-78	-85	-152	-183	-146	-119	·	113	146	174	188	125	120	49	+31					
fx^2	637	468	425	608	549	352	119	·	113	292	522	752	625	720	343	6525					
Σy	-38	-24	-36	-55	-76	-70	-47	-40	37	70	83	124	54	52	36	+70					
$x\Sigma y$	266	144	180	220	228	140	47	·	37	140	249	496	270	312	252	2981					

Relative frequency

$$\bar{x} = \frac{31}{822} = \cdot 038$$

$$\sigma_x^2 = \frac{6525}{822} - (\cdot 038)^2 - \cdot 083$$

$$= 7\cdot 860$$

$$\therefore \sigma_x = 2\cdot 804$$

Relative frequency $\bar{y} = \frac{70}{822} = \cdot 085$

$$\sigma_y^2 = \frac{3770}{822} - (\cdot 085)^2 - \cdot 083$$

$$= 4\cdot 503$$

$$\therefore \sigma_y = 2\cdot 121$$

$$r\sigma_x\sigma_y = \frac{2981}{822} - (\cdot 038 \times \cdot 085)$$

$$= 3\cdot 627$$

$$\therefore r = \frac{3\cdot 627}{2\cdot 121 \times 2\cdot 804} = \cdot 610 \pm \cdot 015$$

value of x in the row headed f_x, then by adding these values we obtain the entries which are to be found in the column $\sum x$. Interchanging the role of x and y we obtain by a similar procedure $\sum f_i y_i$. The special advantage of this method is that three separate checks are available and it can also be extended for the computation of correlation ratios. The method is shown in Matrix I. The three checks are as follows:-

(a) the sum $\sum_j f_j x_j$ for all the rows gives $\sum s$ which must be identical with fx. (**)

(b) the sum $\sum_i f_i y_i$ for all the columns gives $\sum y$ which must be identical with fy. (*)

(c) the values obtained by summation of the entries in the column and row headed $y\sum x$ and $x\sum y$ must be identical. (⊗)

(3) Standardisation of Tests

The rigid standardisation of the tests contained in a battery isof paramount importance to the vocational psychologist. He cannot, for example, compare the psychographic profiles of the individuals he has tested with the occupational psychographs of the jobs he has analysed, unless he has ascertained that the raw scores obtained by such individuals have been properly adjusted in respect of age differences, skewness which may be present in the frequency distributions of those raw scores, etc. The writer has, therefore, made himself fully aware of the significance ofstandardisation and has made himself responsible for the standardisation of all the tests in the present battery with the exception of the Kuhlmann-Anderson Test which is still in the process of re-standardisation.

The method of standardisation is that devised by Thomson (2), who defines standardisation thus: "By standardisation is meant the finding of a line of norms for a test, and a method of calculating some form of generally understood score, such as, especially, a mental age and an intelligence quotient". Briefly the method involves the following statistical procedure.

(i) Tabulate raw scores against age, generally in <u>one month</u> intervals.

(ii) Find median scores for each monthly interval and assume that these medians are the same as the mean scores, which they would be, if the distribution was normal.

(iii) Find the best-fitting straight line for these medians by the method of least squares.

This is done as follows:-

Chronological Age (in completed months)

Raw Score	156	157	158	159	160	161	162	163	164	165	166 167 168 ----etc.----
190 -					34						----------
180 - 189					33					71	----------
170 - 179					32			53	61	70	----------
160 - 169		29			32			51	60	70	-----etc.-----
150 - 159		28			32	33	46	51	60	69	----------
140 - 149		28			32	32	44	51	57	68	----------
130 - 139	17	28			32	31	43	49	55	66	----------
120 - 129	16	26	14	27	30	30	41	48	55	65	----------
110 - 119	14	25	12	26	29	30	37	45	55	61	----------
100 - 109	13	21	11	24	27	26	36	43	49	57	-----etc.-----
90 - 99	10	17	8	21	22	21	33	35	43	52	----------
80 - 89	8	17	6	19	20	18	27	32	31	44	----------
70 - 79	6	13	4	15	15	16	21	28	20	35	----------
60 - 69	5	8	2	12	11	10	16	21	9	24	----------
50 - 59	3	3	-	9	8	6	10	15	6	10	-----etc.-----
40 - 49	2	2	-	4	4	2	4	5	2	3	----------
- 39	1	-	-	2	3	1	1	2	2	2	----------
50%-ile	92.0	83.3	94.5	74.5	83.5	82.0	82.8	77.4	89.0	75.4	etc.

(iv) Plot the medians in a list - first against last, second against second last, etc., ignoring odd one, if there is such. ($a_n - a_1$, $a_{n-1} - a_2$, etc.)

(v) Find the algebraic difference = (b).

(vi) Multiply this by the number of steps of difference = (c)

(vii) Find $\sum c$.

(viii) Divide $\sum c$ by $\frac{n(n^2 - 1)}{6}$. (n = number of monthly intervals)

(ix) Answer is age allowance per age unit (monthly interval).

50%-ile	a		a'		b		c +	-
	115.6	-	92.0	=	23.6 x 23	=	542.8	
	134.5	-	83.3	=	51.2 x 21	=	1075.2	
	129.5	-	94.5	=	35.0 x 19	=	665.0	
	104.5	-	74.5	=	30.0 x 17	=	510.0	
	104.5	-	83.5	=	21.0 x 15	=	315.0	
	122.8	-	82.0	=	40.8 x 13	=	530.4	
	104.5	-	82.8	=	21.7 x 11	=	238.7	
	107.0	-	77.4	=	29.6 x 9	=	246.4	
	97.8	-	89.0	=	8.8 x 7	=	61.6	
	85.5	-	75.4	=	10.1 x 5	=	50.5	
	87.0	-	86.4	=	.6 x 3	=	1.8	
	87.7	-	95.0	=	-7.3 x 1	=		7.3
	1280.9		1015.8				4237.4	7.3

$$\sum c = 4237.4 - 7.3 = \underline{4230.1}$$

$$\frac{n(n^2 - 1)}{6} = \frac{24(24^2 - 1)}{6} = \underline{2300}$$

Age allowance/monthly interval $= \frac{4230.1}{2300} = \underline{1.84}$

Add 1.84 to 50%-ile for each month and these scores represent standard score of 100. (Take to nearest whole number)

As we cannot tell which median is on the straight line obtained by the above method of least squares, it is necessary to obtain the equation of the line. The equation of the line is given by $S = ma - b$.

where S = standardised score

m = age allowance (as found above)

a = age in monthly intervals

b = $m \times$ median age - average of the median scores

Now let the median chronological age = 166.43 months.

The average of the median scores = 95.70

Then $S = 1.84a - (1.84 \times 166.43 - 95.70)$

$$\underline{S = 1.84a - 210.50} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (24)$$

For $\underline{a = 156}$ $\quad \underline{S} = 1.84 \times 156 - 210.50 = \underline{76.50}$

Since it is the median scores (50%-iles) we have calculated, S = 100, so that a raw score of 75.50 for a chronological age of 156 months is equivalent to a standardised score of 100. If the test is being standardised for an age range of 156 to 179 months, then the different a's are substituted in equation (24) above.

A similar method is adopted for the 98%-iles, 84%-iles, 16%-iles, and 2%-iles, thus giving standardised scores of 130, 115, 85, and 70 respectively, if σ is assumed to be 15.

Thomson advocates the use of the 95%-iles and the 5%-iles in finding $+2\sigma$ and -2σ, this does not however ensure that the necessary 96% of each monthly raw score distribution lies between the limits of $+2\sigma$ and -2σ, hence the use of the 98%-iles and 2%-iles above.

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Chapter 5

GROUPS USED IN THE EXPERIMENT

The purpose of this chapter is to give certain information regarding the constitution of the groups which were used in this experiment. According to Kelley (1), there are two essential group characteristics which must always be borne in mind in work of a psychological nature if the studies of such a group are to be statistically valid and if the criteria of homogeneity are to be satisfied. The following are his requirements:-

(a) "The population (or group) should be large", in other words the sampling error must be reduced to as small proportions as is possible. It was originally intended to test all the school 'leavers' in the Edinburgh Educational Area for the year 1937-38, but owing to the fact that the administration of such a scheme would have involved considerable time and energy on the part of those intimately connected with it, if every child leaving school was to be tested, it was ultimately decided to select four of the largest Intermediate Schools in the area, and, in so doing, cover some 2000 pupils (approximately one third of the school 'leavers'). Table I shows the number of pupils who leave all the schools in the area annually.

TABLE I

Year	Type of School				Total
	Primary	Inter.	Secondary	Special	
1936-37	436	3964	2063	137	6600
1935-36	713	3634	2194	172	6713
1934-35	1020	3684	2056	139	6899
1933-34	1088	3100	1866	147	6201
1932-33	1177	1640	1619	98	4534
1931-32	1288	1561	1437	121	4273
1930-31	1629	1727	1762	148	5266
1929-30	1830	1688	1756	197	5471
1928-29	2647	1774	1670	123	6214

In this way, therefore, complexities of administration tended rather to reduce the total number in the group and so increase the sampling error.

The schools which were selected for the investigation were:-

(i) Tynecastle School

(ii) Bellevue School

(iii) James Clark School

(iv) David Kilpatrick School

These schools prepare their pupils for the Day School Lower and Day School Higher Certificates, but the great majority of the pupils leave on attaining the minimum statutory school leaving age of fourteen years, and do not remain to complete the three years' Intermediate course. Table II shows how the pupils are distributed in the various school groups. It will be noted that Tynecastle School contributes 37.6% to the total group, Bellevue School 26.4%, James Clark School 21.9%, and David Kilpatrick School 14.1%. Some 1838 pupils (955 boys and 883 girls) were tested with at least one test, absenteeism, however, reduced the number tested with the complete battery to 1674 pupils (896 boys and 778 girls). Despite this, the number in the group is fairly representative of the juvenile population who terminate their scholastic careers on attaining the age of fourteen. As far as possible, therefore, we believe that Kelley's first requirement has been satisfied.

TABLE II

School	Male Group		Female Group		Total Group	
	No.	%	No.	%	No.	%
Tynecastle	338	35·39	352	39·86	690	37·53
Bellevue	258	27·02	227	25·70	485	26·38
James Clark	206	21·57	197	22·32	403	21·93
David Kilpatrick	153	16.02	107	12·12	260	14·16
Total	955	100·00	883	100·00	1838	100·00

(b) Kelley's second requirement is that the "population should be homogeneous, as far as possible, from the standpoint of maturity, race, sex, and general sholastic training." It is the general belief that the school groups do satisfy this requirement, and it is hoped to bear out this view when we come to examine the statistical data which appear in succeeding chapters.

Total Male Group.

The frequency distribution of the chronological ages for the total male group is shown in Table IIIa, while the histographic representation of the distribution appears on the following page. As shown in Table III, the mean chronological age for this group is 166·560 months. The mean chronological age for the Tynecastle group is 166·972 months, the corresponding means for the Bellevue, James Clark, and David Kilpatrick groups being 166·419, 165·665, and 167·085 months respectively.

The standard deviation for the total male group is 6·310 months, while that for the Tynecastel group is 6·780 months. The corresponding standard deviations for the Bellevue, James Clark, and David Kilpatrick male groups are 6·030, 6·375, and 5·395 months respectively.

TABLE III

	School				Total
	T	B	J.C.	D.K.	
Mean	166·972	166·419	165·665	167·058	166·560
Standard deviation	6·780	6·030	6·375	5·395	6·310

Probable error (mean)..........	±·135
Median........................	166·427
Probable error (median)........	±·169
Upper quartile (Q_3)............	170·400
Lower quartile (Q_1)............	162·196
Semi-interquartile range........	4·102
Skewness (β_1)..................	+·063

Note:- The descriptive parameters which appear in the lower half of Table III refer to the total frequency distribution of the male chronological ages.

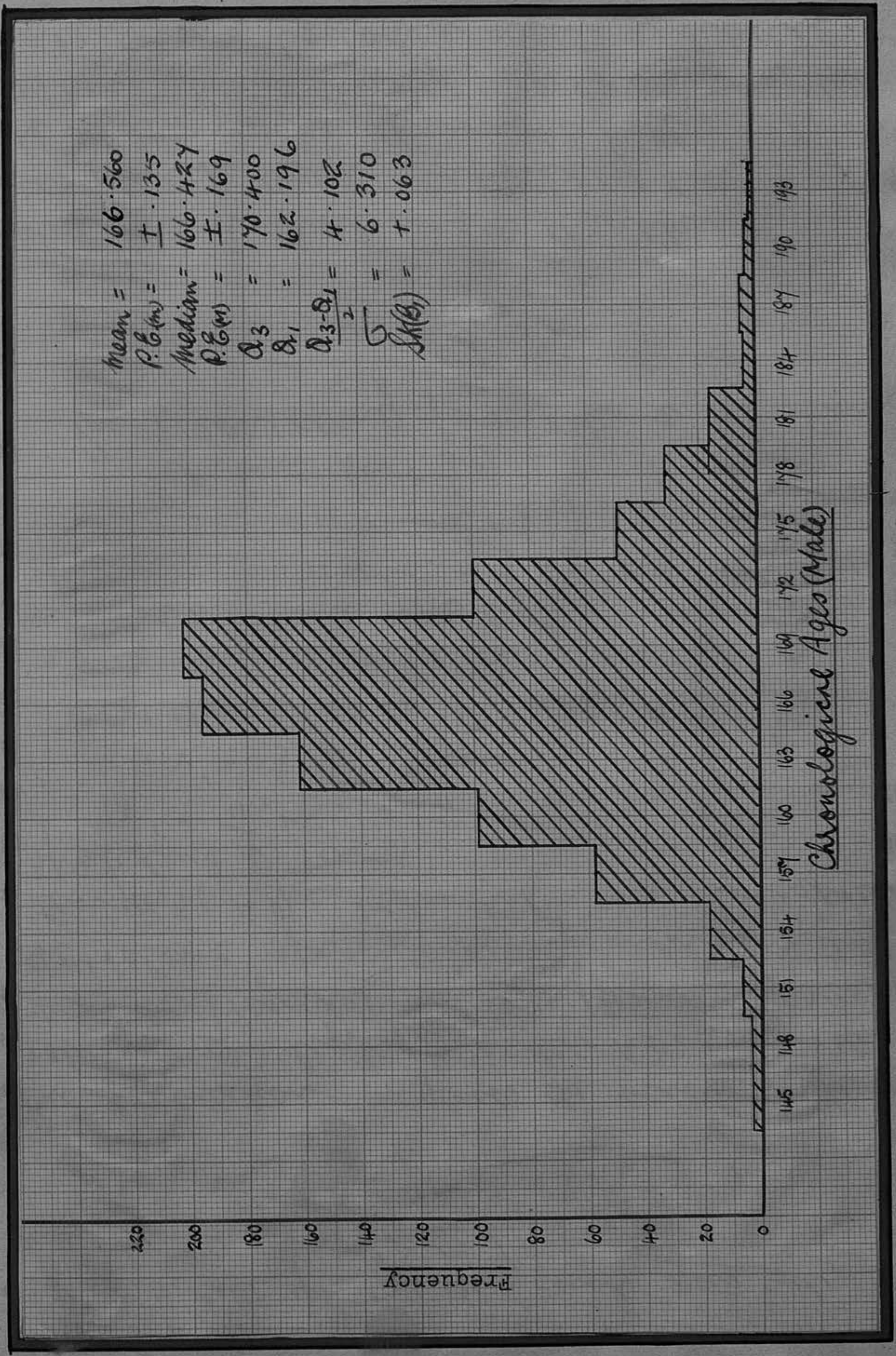
It will be seen from the above table that the frequency distribution

TABLE III

CHRONOLOGICAL AGES OF TOTAL GROUP (MALE)

C.A. months	School				Total	
	T	B	J.C.	D.K.		
144	1	-	-	-	1	
145	-	-	-	-	-	
146	-	-	2	-	2	
147	1	-	-	-	1	
148	-	-	1	-	1	
149	-	-	-	-	-	
150	-	-	-	-	-	29
151	1	-	1	-	2	
152	-	-	3	1	4	
153	2	2	1	-	5	
154	4	1	1	-	6	
155	3	1	1	2	7	
156	3	2	5	7	17	
157	13	5	8	1	27	
158	4	6	1	3	14	
159	9	9	5	1	24	
160	18	8	7	3	36	
161	15	16	7	1	39	514
162	13	16	12	8	49	
163	13	18	19	3	53	
164	22	20	11	7	60	
165	28	19	12	10	69	
166	10	16	17	11	54	
167	28	18	13	13	72	
168	29	15	18	26	88	
169	11	17	9	16	53	
170	20	19	13	9	61	
171	21	7	18	18	64	
172	10	4	3	1	18	
173	6	7	3	2	18	383
174	5	10	3	-	18	
175	8	4	-	-	12	
176	10	3	4	2	19	
177	3	2	3	1	9	
178	7	1	-	1	9	
179	8	3	1	2	14	
180	8	2	1	1	12	
181	2	-	-	-	2	
182	-	2	-	-	2	
183	-	1	-	-	1	
184	-	2	-	1	3	
185	-	-	-	-	-	29
186	-	-	2	2	4	
187	1	-	-	-	1	
188	-	-	-	-	-	
189	-	1	1	-	2	
190	-	1	-	-	1	
191	-	-	-	-	-	
192	1	-	-	-	1	
	338	258	206	153	955	

HISTOGRAM OF DATA CONTAINED IN TABLE III



of the chronological ages for this group is slightly positively skew, this is, however, not statistically significant.

Table IIIa shows that the age range for the group is from 144 months (12 years) to 192 months (16 years), the standard deviation, however, is only 6.310 months. This would seem to indicate that the dispersion is small and that the group is fairly homogeneous as far as chronological age is concerned.

Total Female Group

The frequency distribution of the chronological ages for the total female group is shown in Table IVa, while the histographic representation of the distribution appears on the following page. As shown in Table IV, the mean chronological age for this group is 166.162 months. The mean chronological age for the Tynecastle 165.409 months, while the corresponding means for Bellevue, James Clark, and David Kilpatrick female groups are 167.132, 165.122, and 168.495 months respectively.

The standard deviation for the total female group is 6.430 months, while that for the Tynecastle group is 6.830 months. The corresponding standard deviations for the Bellevue, James Clark, and David Kilpatrick groups are 6.695, 5.210, and 5.585 months respectively.

Table IV shows that the frequency distribution of the chronological ages for this group is slightly negatively skew, but again this is not statistically significant. It is rather interesting to note that the degrees of skewness for the two distributions of chronological ages are practically equal, but in the opposite direction, viz. +.063 and -.065.

As in the case of the male group, the standard deviation of 6.430

6.430 months is small in comparison with the total age range which in the female group is from 145 months (12 years 1 month) to 192 months (16 years).

TABLE IV

	School				Total Group
	T	B	J.C.	D.K.	
Mean	165.409	167.132	165.122	168.495	166.162
Standard deviation	6.830	6.695	5.210	5.585	6 430
Probable error (mean)					±.146
Median					166.302
Probable error (median)					±.183
Upper quartile (Q_3)					170.105
Lower quartile (Q_1)					161.751
Semi-interquartile range					4.172
Skewness (β_1)					-.065

Note:- The descriptive parameters which appear in the lower half of the above Table refer to the total frequency distribution of the female chronological ages.

It will be noted that there is a difference of .398 months between the mean chronological ages for both groups, this is however not statistically significant. The difference of .120 months in the standard deviations of the respective groups is also not significant.

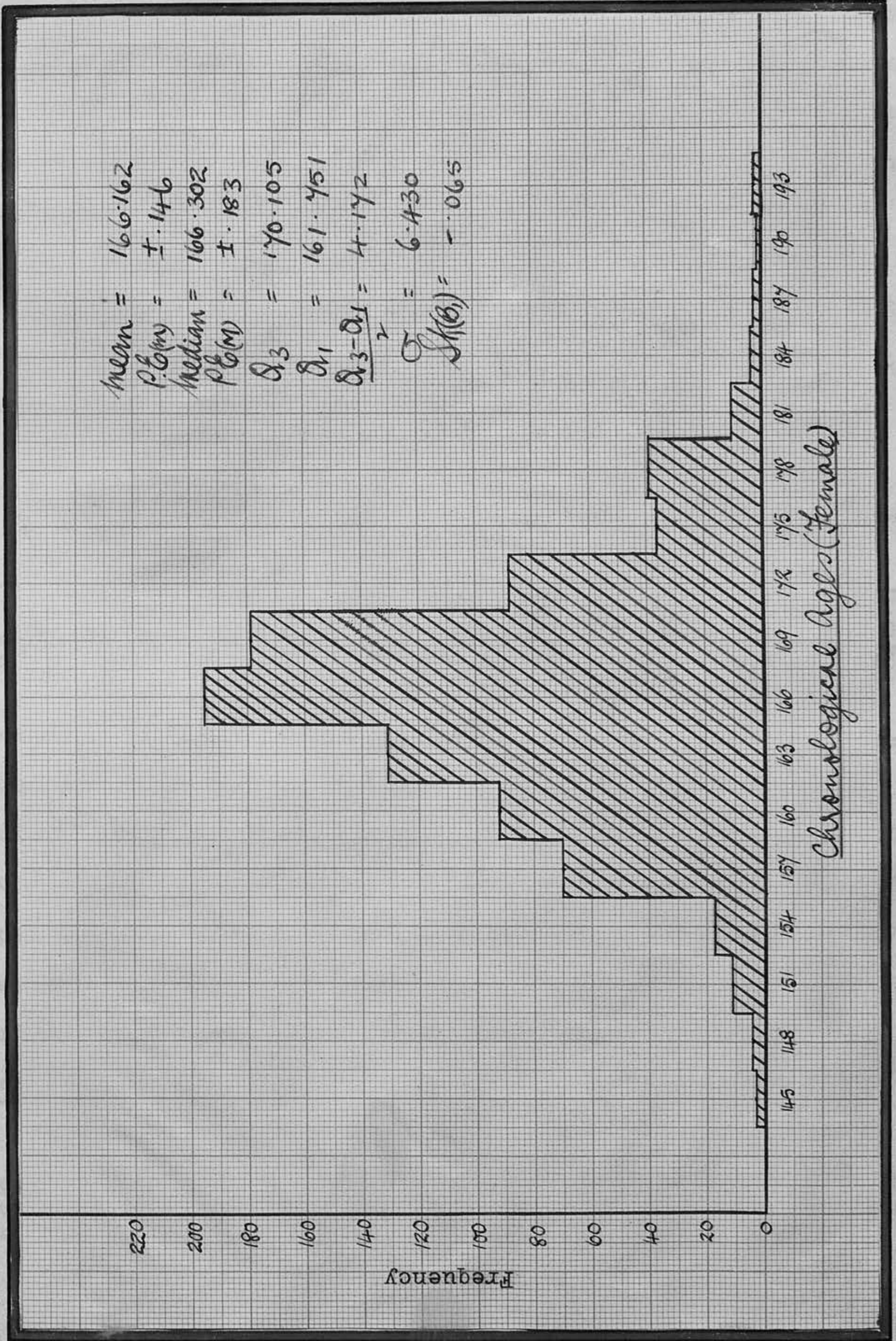
Total Group (Male and Female).

The frequency distribution of the chronological ages for the

CHRONOLOGICAL AGES OF TOTAL GROUP (FEMALE)

C.A. Months	School				TOTAL	
	T	B	J.C.	D.K.		
144	-	-	-	-	-	
145	1	-	-	-	1	
146	1	-	1	-	2	
147	-	-	1	-	1	
148	1	-	-	-	1	
149	1	-	1	-	2	35
150	2	-	-	-	2	
151	3	1	-	-	4	
152	4	1	-	-	5	
153	1	2	-	-	3	
154	4	1	2	-	7	
155	4	1	2	-	7	
156	12	6	4	-	22	
157	5	5	3	3	16	
158	12	6	8	6	32	
159	14	8	6	-	28	
160	15	5	5	3	28	
161	15	7	14	-	36	488
162	17	22	12	4	55	
163	24	4	7	2	37	
164	15	13	10	1	39	
165	23	13	19	-	55	
166	17	11	17	3	48	
167	23	26	23	20	92	
168	36	10	16	5	67	
169	18	6	15	14	53	
170	15	7	14	23	59	
171	19	16	4	8	47	
172	14	9	5	2	30	
173	5	4	-	2	11	342
174	5	4	1	2	12	
175	4	6	3	2	15	
176	2	5	1	1	9	
177	4	5	1	4	14	
178	2	5	2	-	9	
179	4	12	-	-	16	
180	3	2	-	-	5	
181	-	2	-	-	2	
182	1	2	-	-	3	
183	1	-	-	-	1	
184	1	-	-	-	1	
185	1	-	-	-	1	18
186	1	-	-	1	2	
187	-	-	-	-	-	
188	-	-	-	-	-	
189	-	-	-	-	-	
190	-	-	-	1	1	
191	-	-	-	-	-	
192	2	-	-	-	2	
	352	227	197	107	883	

HISTOGRAM OF DATA CONTAINED IN TABLE



total group (male and female) is shown in Table Va, while its histographic representation appears on the following page. As shown in Table V , the mean chronological age for this group is 166.369 months. The mean chronological age for the Tynecastle group (male and female) is 166.174 months, while the corresponding means for the Bellevue, James Clark, and David Kilpatrick groups are 166.752, 165.407, and 167.673 months respectively.

The standard deviations for the Tynecastle, Bellevue, James Clark, and David Kilpatrick groups (male and female) are 6.850, 6.360, 5.830, and 5.575 months respectively. The standard deviation for the total group (male and female) is 6.370 months.

TABLE V

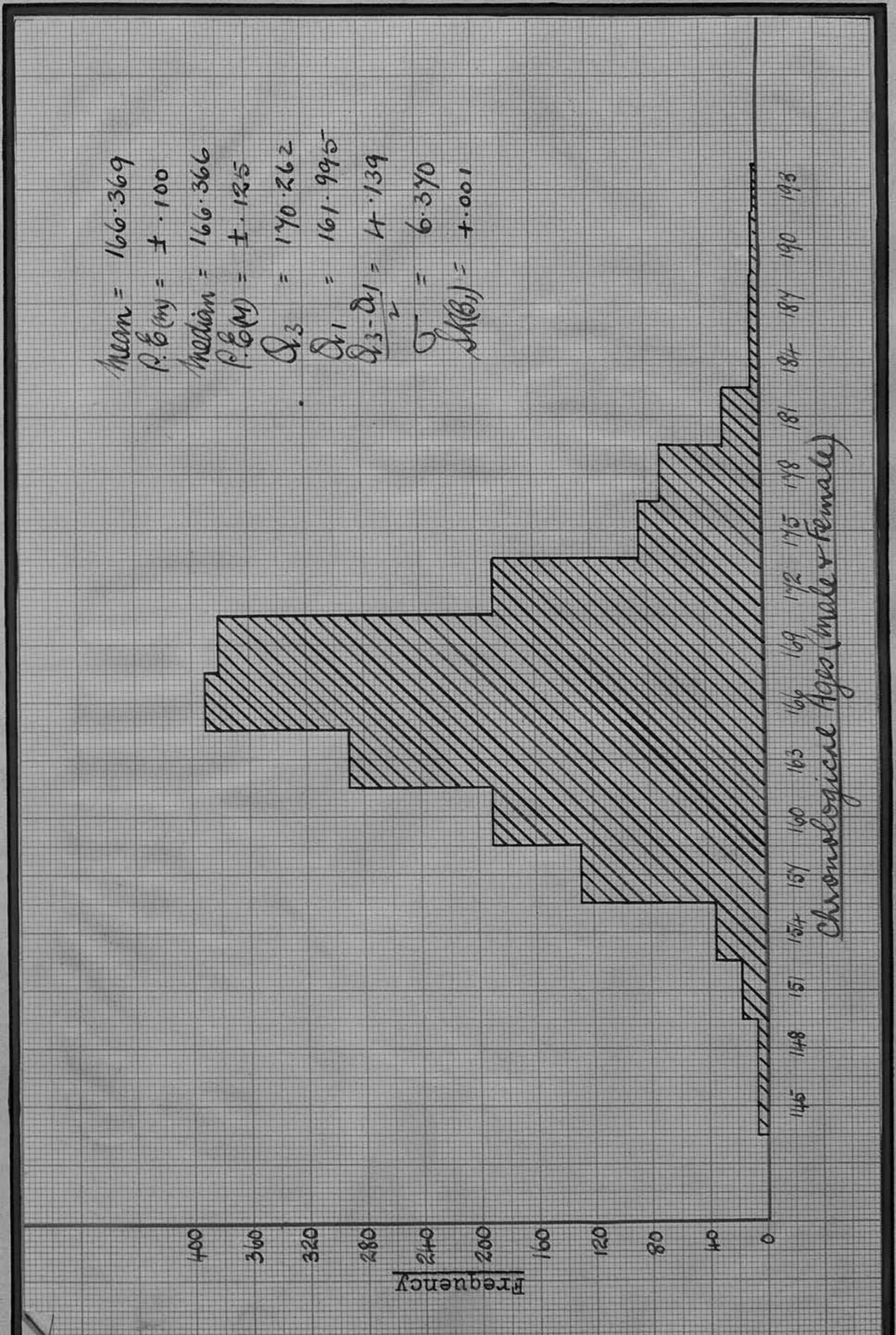
	School				Total Group
	T	B	J.C.	D.K.	
Mean	166.174	166.752	165.407	167.673	166.369
Standard deviation	6.850	6.360	5.830	5.575	6.370
Probable error (mean)................................					$\pm$.100
Median...					166.366
Probable error (median)..............................					$\pm$.125
Upper quartile (Q_3)...............................					170.262
Lower quartile (Q_1)...............................					161.995
Semi-interquartile range.............................					4.139
Skewness (β_1).................................					+.001

Note:- The descriptive parameters which appear in the lower half of the above Table refer to the total frequency distribution of the chronological ages (male and female).

CHRONOLOGICAL AGES OF TOTAL GROUP (MALE AND FEMALE)

C.A. months	School T	B	J.C.	D.K.	Total	
144	1	-	-	-	1	
145	1	-	-	-	1	
146	1	-	3	-	4	
147	1	-	1	-	2	
148	1	-	1	-	2	
149	1	-	1	-	2	64
150	2	-	-	-	2	
151	4	1	1	-	6	
152	4	1	3	1	9	
153	3	4	1	-	8	
154	8	2	3	-	13	
155	7	2	3	2	14	
156	15	8	9	7	39	
157	18	10	11	4	43	
158	16	12	9	9	46	
159	23	17	11	1	52	
160	33	13	12	6	64	
161	30	23	21	1	75	1002
162	30	38	24	12	104	
163	37	22	26	5	90	
164	37	33	21	8	99	
165	51	32	31	10	124	
166	27	27	34	14	102	
167	51	44	36	33	164	
168	65	25	34	31	155	
169	29	23	24	30	106	
170	35	26	27	32	120	
171	40	23	22	26	111	
172	24	13	8	3	48	
173	11	11	3	4	29	725
174	10	14	4	2	30	
175	12	10	3	2	27	
176	12	8	5	3	28	
177	7	7	4	5	23	
178	9	6	2	1	18	
179	12	15	1	2	30	
180	11	4	1	1	17	
181	2	2	-	-	4	
182	1	4	-	-	5	
183	1	1	-	-	2	
184	1	2	-	1	4	
185	1	-	-	-	1	47
186	1	-	2	3	6	
187	1	-	-	-	1	
188	-	-	-	-	-	
189	-	1	1	-	2	
190	-	1	-	1	2	
191	-	-	-	-	-	
192	3	-	-	-	3	
	690	485	403	260	1838	

HISTOGRAM OF DATA CONTAINED IN TABLE



The degree of skewness for the distribution of chronological ages (male and female) has a value of +.001, so that for all practical purposes the distribution is normal in so far as skewness is concerned.

Having thus analysed in some detail the various distributions of chronological ages, we can resonably say that the total group tested in this experimental scheme of vocational guidance is homogeneous from the standpoint of chronological age.

In Table VI, there is tabulated in a convenient form the percentage attendances at the various tests which composed the vocational guidance battery. It will be noted that in three of the tests, viz. Practical Intelligence Test, Manual Dexterity Test, and Colour Blindness Test, there were perfect attendances for all groups and for all schools. This very desirable state of affairs is due to the fact that these tests were spread over several days in the school testing programme, so that any absentees in the school groups, who were not present when their own class was tested, were given the opportunity of completing the test with another class on their return to school. Thisprocedure was found to be impracticable in the case of the Linguistic Intelligence, the Standardised English Test, and the Standardised Arithmetic Test because these were administered simultaneously on the same day in all the schools. The percentage attendances at the Mechanical Aptitude Test are low in all the schools, since this test was administered during a week when rather stormy weather conditions prevailed and this resulted in a considerable falling-off in school attendances.

TABLE SHOWING PERCENTAGE ATTENDANCES AT THE VARIOUS TESTS

		School				Total
		T	B	J.C.	D.K.	
	Male Group	97·63	91·85	99·02	86·28	94·56
(A)	Female Group	94·88	93·40	94·43	84·10	93·09
	Total Group	96·25	92·58	96·79	85·39	93·83
	Male Group	100·00	100·00	100·00	100·00	100·00
(B)	Female Group	100.00	100·00	100·00	100·00	100·00
	Total Group	100·00	100·00	100·00	100·00	100·00
	Male Group	93·80	96·14	96·12	86·94	93·83
(C)	Female Group	85·23	92·06	90·86	84·10	88·10
	Total Group	89·43	94·23	93·54	85·76	91·07
	Male Group	100·00	100·00	100·00	100·00	100·00
(D)	Female Group	100·00	100·00	100·00	100·00	100·00
	Total Group	100.00	100·00	100·00	100·00	100·00
	Male Group	97·63	91.85	99·02	86·28	94·56
(E)	Female Group	94·88	93·40	94·43	84·10	93·09
	Total Group	96·25	92·58	96·79	85·39	93·83
	Male Group	97·63	93·03	100·00	86·94	95·19
(F)	Female Group	94·88	93·85	93·91	91·58	93·99
	Total Group	96·25	93·42	97·03	88.84	94·58
(G)	Male Group	100·00	100·00	100·00	100·00	100·00

A = Linguistic Intelligence Test
B = Practical Intelligence Test
C = Mechanical Aptitude Test
D = Manual Dexterity Test
E = Standardised English Test
F = Standardised Arithmetic Test
G = Colour Blindness Test

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Chapter 6

THE PHYSICAL FACTOR IN RELATION TO VOCATIONAL GUIDANCE

"The truth is that human beings differ as widely in their physical as in their mental characteristics and that a large percentage of them are physically defective. Further, even in these days of mechanised labour, industrial occupations vary greatly in respect of the physical strains which they impose, as well as in respect of the risks of injury and disease which they entail. It follows that a well conceived scheme of vocational guidance necessarily makes provision for a careful physical and medical examination of the child leaving school"

Macrae : "Talents and Temperaments"

Vocational guidance may be said to be one aspect of the still greater subject of the health and happiness of all those who work, by hand or brain, in the trades, occupations, and industries of the country. The whole question of the physical factor in industry is so bound up with the problems incidental to the control of industrial personnel that any scheme of vocational guidance attempted in an educational area must be so devised as to derive the greatest benefits from the medical services in that area.

Strange as it may seem, this aspect of child guidance does not receive the consideration that it so justly deserves, and many authorities on vocational guidance relegate it to a status of secondary importance. Kitson (1), for example, assesses the physical aspect of vocational guidance thus : "By the physiological point of view we mean the condition of the organs of the body - heart, lungs, digestive system, sense organs, etc. Certain occupations make special demands on various organs of the body. For example, to be an aviator one must be able to maintain his sense of direction even when he is flying head downward, and must be able to endure the reduced air pressure of high altitudes. A few other occupations make special demands, but most lines of work can be entered safely by one who has the physiological equipment of the average person". With this naive statement Kitson summaries the physical aspect of child guidance, being quite oblivious to the fact that "the physiological equipment of the average person" does not necessarily ensure compatibility with all branches of industry. As with mental and temperamental equipment, so the various occupational orders demand different degrees of physiological equipment as a minimum requirement for success. This rather scant consideration of the medical aspect of vocational guidance is happily not a general one, and we find that in many countries there is the very closest collaboration between the medical services and those officials responsible for the placement of the juvenile. For example, in France the vocational guidance of the juvenile is based first and foremost upon a physical examination, supplemented by a psychological examination. Bonnardel and Laugier (2) have done very important work in connection with the study of occupations which are contra-indicated by particular physical defects. They have constructed "grilles" for 32 physical defects, and accompanying these "grilles" is a table of 477 occupations. The numbers of these occupations are so listed that when a particular "grille" is placed over them it will cover the numbers corresponding to the occupations which are contra-indicated by the particular physical defect and will leave visible those for which the subject would be fit as far as his physical condition is concerned.

Let us, however, concentrate our attention on the human body and the occupation to which it is devoted for so many hours of the working day. In the first place, we shall discuss the influence of mere size, strength, and muscular development on the occupation which is to be followed.

Regrettably, from one point of view, the time has long passed, exceptin a few occupations, when mere physical strength is the deciding qualification for employment. In few spheres of industry are the strong arms of the village blacksmith of much consequence in a day where the motor car has largely taken the place of the horse and when mass production is the predominant trend in most industries; when manual labour is gradually retreating before the onslaught of the machine and even individual craftsmanship and mechanical skill in working wood and metals are less required than the capacity to endure the boredom that usually goes hand in hand with the routine operations of mass-production. The juvenile whose principal qualification is strength of body and limb usually finds that the only outlet for his superfluous energy is to be found in sport and recreation, and not as formerly, in the occupation. This is essentially true of the strong and muscular youngster who often finds that he is perfectly happy in a sedentary occupation, provided he is given facilities, in sport and recreation, for the release of surplus energy. Generalising on the question of physique, as it is understood above, one can therefore say that, as a single criterion for employment, it is becoming increasingly inadequate in all but a very few occupations.

The question of sex in relation to an occupation can also be conveniently discussed in this chapter. In the march of time, an ever-widening field of employment opens out to women, and the increasing complexity of the social and industrial structure is daily adding to their opportunities for earning a livelihood. As far as the factor of physique is concerned, there is no reason to suppose that, in an age when severe and prolonged muscular effort is seldom demanded in industry, the female is less suited to most occupations than the male. Even women's most important physical disability from this point of view, apart from child-bearing, has been found in recent years to be less disadvantageous industrially than it was at one time supposed. Arnold (3) is of the opinion that, "functional periodicity does not exercise a fundamental and characteristic influence on the intellectual abilities of women and that much of the incapacity claimed is fictitious". It is an established fact that there are, at the present time, more women than men employed in certain industries, while, in other occupations, it is more a matter of custom than of physical incapacity that male workers outnumber the female.

It is generally recognised that, while the individual's mental endowment plays a great part in the process of his adjustment to an occupation, his physical endowment also has an important role. Occupational mal-adjustment, as we have seen, may be due to three causes:- (a) mental incompatibility, (b) temperamental incompatibility, and (c) physical incompatibility. We find that an engine-driver, on account of the signalling system in use at the present day, must have normal colour vision; deafness is a serious disqualification for an occupation such as a wireless operator; it would be unwise for a person who suffers from occasional attacks of epilepsy to engage in an occupation which involves working at some distance above the ground, and so on. These effects of physical disability on occupational efficiency are very serious and far-reaching, so much so, that any attempt to offer vocational advice, without the co-operation of the medical service, would be exceedingly futile anddangerous. The contra-indications furnished by the Medical Report are, therefore, of inestimablevalue to the vocational psychologist.

One aspect of the physical factor still remains to be discussed and that is the question of the health of the individual - an aspect which pervades and always will pervade all human activities. Industry depends, as never before, upon the performance by many individuals of isolated acts, the results of which, added together, constitute the manufactured article. In order that production shall be uninterrupted and regular it is of the most fundamental importance that the many individuals associated with it shall be punctual and shall be in attendance at the factory every day. Lateness and irregular attendance resulting from ill-health are a very serious handicap to industry. It is undoubtedly true that the health of the individual affects his attitude to his occupation and taken together with his psychical reactions plays its part in determining his happiness in it. Earle (4) summarises the position thus:- "The consequences of physical maladjustment at work may be in some ways even more serious than those of mental maladjustment". So that speaking generally, the man who is physically happy in his work is efficient at it.

<u>The procedure followed in this scheme</u>

In thisscheme of vocational guidance the resources of the Edinburgh School Medical Service were utilised to the fullest extent. The medical examination of 1055 pupils (556 male and 499 female) was conducted by the School Medical Officer (Dr. Linklater) and his assistants who visited the various schools and individually examined each child. The medical staff were instructed to direct their attention to the examination of those physical conditions which are of special significance in relation to an occupation. Unfortunately, the School Medical Service found it impossible to examine those children involved in the scheme who left school on March 1st, 1938, so that the medical statistics only concern those who left school between that date and September 1st, 1938. The resultsof the medical examination were recorded on a special Medical Report (see page 77, Appendix A). This Report is essentially similar to that used by Earle in the London experiment in vocational guidance, but contains certain modifications suggested by

TABLE SHOWING NUMBER OF MEDICAL CONTRA-INDICATIONS

(Male)

Table I

Number of Contra-indications	School				Total
	T	B	J.C.	D.K.	
0	137	86	132	42	397
1	34	41	27	14	116
2	11	3	9	-	23
3	4	3	4	1	12
4	2	1	1	-	4
5	-	3	-	-	3
6	-	-	-	-	-
7	1	-	-	-	1
Totals	189	137	173	57	556

TABLE SHOWING NUMBER OF MEDICAL CONTRA-INDICATIONS

(Female)

Table II

Number of Contra-indications	School				Total
	T	B	J.C.	D.K.	
0	163	114	87	13	377
1	41	28	18	7	94
2	3	6	4	-	13
3	2	-	-	-	2
4	-	7	1	-	8
5	1	1	1	-	3
6	-	-	1	-	1
7	1	-	-	-	1
Totals	211	156	112	20	499

TABLE SHOWING NUMBER OF MEDICAL CONTRA-INDICATIONS

(Male and Female)

Table III

Number of contra-indications	School T	School B	School J.C.	School D.K.	Total
0	300	200	219	55	774
1	75	69	45	21	210
2	14	9	13	-	36
3	6	3	4	1	14
4	2	8	2	-	12
5	1	4	1	-	6
6	-	-	1	-	1
7	2	-	-	-	2
Totals	400	293	285	77	1055

by Dr. Linklater. The Medical Report is self-explanatory and a detailed description of it is, therefore, unnecessary. It might be, however, noted that the Medical Reports furnished by the School Medical Service are serving a dual purpose, viz:-

(a) supplying those responsible for the conduct of the scheme of vocational guidance with the medical data of the children tested.

(b) supplying the Ministry of Health with data for the National Health Record Cards of juveniles who have just left school.

An analysis of the medical data reveals that, of the 1055 children examined (556 boys and 499 girls), no contra-indications were noted in 774 cases (397 boys and 377 girls). This finding does not, of course, signify that these 774 children were physically perfect, since a goodly number, although healthy, were average or below average in physique. Table I shows the classification of juveniles (male) according to the number of contra-indications noted, while Table IV shows the number of contra-indications expressed as percentages. It will be noted that in 71.4% of the total male group no contra-indications were revealed on examination. In 20.9%, one contra-indication was found, while in 4.1%, two contra-indications were noted. Individuals, amounting in all to 3.6% of the total male group, were found who had three, four, five, and seven contra-indications recorded in their Medical Reports.

Table II shows the classification of juveniles (female) according to the number of contra-indications noted, while, as above, Table IV shows those expressed as percentages. Of the 499 girls medically examined 75.6% revealed no contra-indications, while one contra-indication was noted in 18.8% of the cases. It will also be noted that in 2.6% of the total female group two contra-indications were recorded. Individuals, amounting to some 3.0% of the total female group, were found who had three, four, five, six, and seven contra-indications recorded in their Medical Reports.

Table III shows corresponding data for the group (male and female) taken as a whole, and, as before, Table IV shows the number of contra-indications expressed as percentages.

It is interesting to compare these percentages with those found by Earle in the London experiment. He found that, of the 523 children (269 boys and 254 girls) who were medically examined, 65.4% of the boys and 61.4% of the girls had no contra-indications noted. When we compare these figures with those obtained in the Edinburgh scheme, we find that the percentages of the "no contra-indication" groups, both male and female, are much higher in the Edinburgh group than in the London group. This would /

seem to indicate that the Edinburgh juveniles are physically better fitted for occupational life than are the London juveniles of a similar age. Another source of interest is the fact that in the London scheme the percentage of the "no contra-indication" group is higher in the case of the boys than the girls, indicating that the boys, generally, were more healthy than the girls of a similar age. In the Edinburgh

TABLE SHOWING MEDICAL CONTRA-INDICATIONS EXPRESSED AS PERCENTAGES

Table IV

Number of Contra-indications	Male		Female		Male and Female	
	No.	%	No.	%	No.	%
0	397	71.4	377	75.6	774	73.4
1	116	20.9	94	18.8	210	19.9
2	23	4.1	13	2.6	36	3.4
3	12	2.2	2	.4	14	1.3
4	4	.7	8	1.6	12	1.1
5	3	.5	3	.6	6	.6
6	-	-	1	.2	1	.1
7	1	.2	1	.2	2	.2
Totals	556	100.0	499	100.0	1055	100.0

investigation we find that the reverse is the case, the girls being more healthy than the boys. One cannot, of course, say whether these findings are significantly different or not, since the children in the two groups, London and Edinburgh, were examined by different school medical services, but it is interesting to note the differences between the two groups.

CLASSIFICATION OF MEDICAL CONTRA-INDICATIONS

(Male)

Table V

Contra-indication	School				Total
	T	B	J.C.	D.K.	
Muscular strain	45	34	19	7	105
Good sight	5	11	13	2	31
Exposure	7	5	4	1	17
Damp Atmosphere	5	5	2	-	12
Speech	4	1	4	3	12
Cold	2	5	3	1	11
Dusty Atmosphere	4	3	1	-	8
Nervous Strain	2	4	1	1	8
Standing	3	2	2	-	7
Good hearing	1	-	4	1	6
Climbing	2	1	2	-	5
Heat	1	-	4	-	5
Dry Hands	1	3	-	-	4
Indoor work	-	1	2	1	4
Sitting	1	-	-	-	1

Tables V, VI, and VII show classifications of the various contra-indications according to the frequency with which each was recorded for the total male group, for the total female group, and for the whole group,

CLASSIFICATION OF MEDICAL CONTRA-INDICATIONS

(Female)

Table VI

Contra-indication	School				Total
	T	B	J.C.	D.K.	
Muscular strain	24	27	13	4	68
Good sight	7	10	9	-	26
Exposure	3	10	2	-	15
Damp Atmosphere	2	9	3	-	14
Speech	1	1	1	1	4
Cold	3	10	2	1	16
Dusty atmosphere	1	-	2	-	3
Nervous strain	5	3	1	-	9
Standing	8	2	3	1	14
Hearing	4	-	3	-	7
Climbing	3	-	-	-	3
Heat	-	-	-	-	-
Dry hands	2	1	-	-	3
Indoor work	-	-	2	-	2
Sitting	2	-	-	-	2

irrespective of sex. Table VIII shows the classified contra-indications expressed as percentages for each of the three groups enumerated above. It will be seen, on examination of Table VIII, that in both the male and female groups the most frequently occurring contra-indication is that of muscular strain. In the case of the boys this particular contra-

CLASSIFICATION OF MEDICAL CONTRA-INDICATIONS

(Male and Female)

Table VII

Contra-indication	School				Total
	T	B	J.C.	D.K.	
Muscular strain	69	61	32	11	173
Good sight	12	21	22	2	57
Exposure	10	15	6	1	32
Damp atmosphere	7	14	5	-	26
Speech	5	2	5	4	16
Cold	5	15	5	2	27
Dusty atmosphere	5	3	3	-	11
Nervous strain	7	7	2	1	17
Standing	11	4	5	1	21
Good hearing	5	-	7	1	13
Climbing	5	1	2	-	8
Heat	1	-	4	-	5
Dry hands	3	4	-	-	7
Indoor work	-	1	4	1	6
Sitting	3	-	-	-	3

indication accounts for 18.9% of the group examined, while, in the case of the girls, the corresponding figure is 13.6%. The difference in percentage frequency, as far as concerns this particular contra-indication, is very significant, for we shall see later that the girls, taken as a group, are physically superior to the boys of a similar age. In fact, an examination

CLASSIFIED MEDICAL CONTRA-INDICATIONS EXPRESSED AS PERCENTAGES

Table VIII

Contra-indication	Male		Female		Male and Female	
	No.	%	No.	%	No.	%
Muscular strain	105	18.9	68	13.6	173	16.3
Good sight	31	5.6	26	5.2	57	5.4
Exposure	17	3.1	15	3.0	32	3.0
Damp atmosphere	12	2.2	14	2.8	26	2.5
Speech	12	2.2	4	.8	16	1.5
Cold	11	1.9	16	3.2	27	2.6
Dusty atmosphere	8	1.4	3	.6	11	1.0
Nervous strain	8	1.4	9	1.8	17	1.6
Standing	7	1.3	14	2.8	21	2.0
Good hearing	6	1.1	7	1.4	13	1.2
Climbing	5	1.0	3	.6	8	.8
Heat	5	1.0	-	-	5	.5
Dry hands	4	.7	3	.6	7	.6
Indoor work	4	.7	2	.4	6	.6
Sitting	1	.2	2	.4	3	.3

of the percentage frequencies for the classified contra-indications reveals that in most cases the frequency is greater in the case of the boys than of the girls.

It is of interest to note that a survey of the children's occupational ambitions in light of the results of the medical examination shows that approximately 13% of the boys were aspiring to a career for which they were unsuited on medical grounds, while /

the corresponding percentage for the girls was 9%. Earle, in the London experiment, found that approximately 15% of the children tested (he does not discriminate between the sexes) had vocational ambitions which were incompatible with their physical condition. The Edinburgh figures are, therefore, lower than those of London.

It will be noted from the Medical Report that the school medical service was asked to rate the children for nutrition, muscular development, and vascular tone on the basis of a three-point scale, viz. a, b, and c. Physical fitness ratings have been devised which incorporate the information derived from the above ratings, they are as follows:-

A designates an individual who is rated a in nutrition, muscular development, and vascular tone.

B designates an individual who is rated a in two of these aspects and rated b in a third.

C+ designates an individual who is rated b in two of these aspects and a in a third.

C designates an individual who is rated b in all three aspects.

C- designates an individual who is rated b in two of these aspects and c in a third.

D designates an individual who is rated c in two of these aspects and b in a third.

E designates an individual who is rated c in all three aspects.

Distributions of physical fitness ratings based on this seven-point scale are shown in Tables IX, X, and XI. Table IX shows that 261 boys, or 47.0% of the total male group, are rated b for nutrition, muscular development, and vascular tone. Table XII shows the percentage frequencies of the other physical ratings, while the histographic representation of those percentage frequencies appears below Table IX.

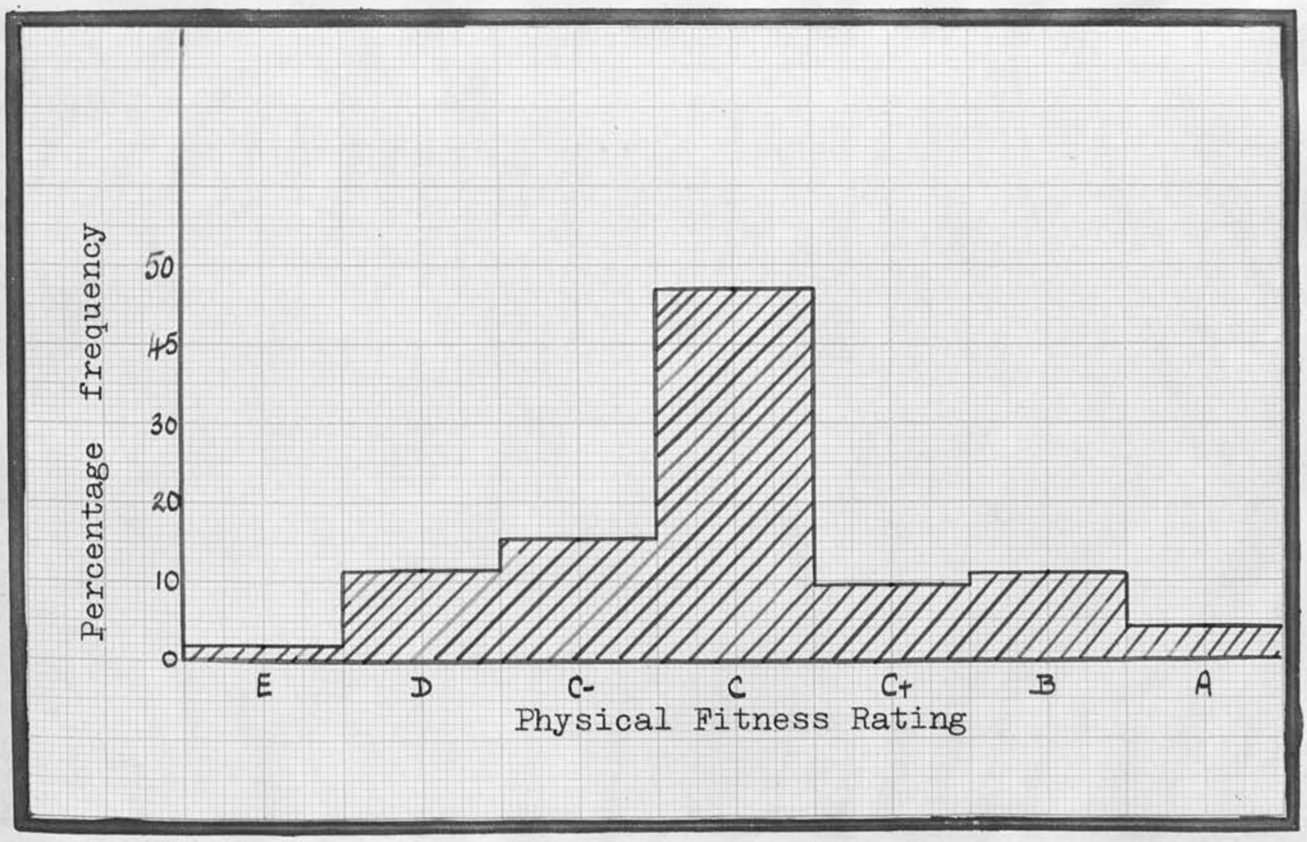
Table X shows that 254 girls, or 50.9% of the total female group, are

DISTRIBUTION OF PHYSICAL FITNESS RATINGS

(Male)

Table IX

Rating	School				Total
	T	B	J.C.	D.K.	
A	9	2	11	1	23
B	18	9	23	11	61
C+	14	9	24	6	53
C	83	63	88	27	261
C-	37	29	13	5	84
D	24	25	10	4	63
E	4	-	4	3	11
	189	137	173	57	556
%	56·0%	53·1%	84·0%	37·3%	58·2%

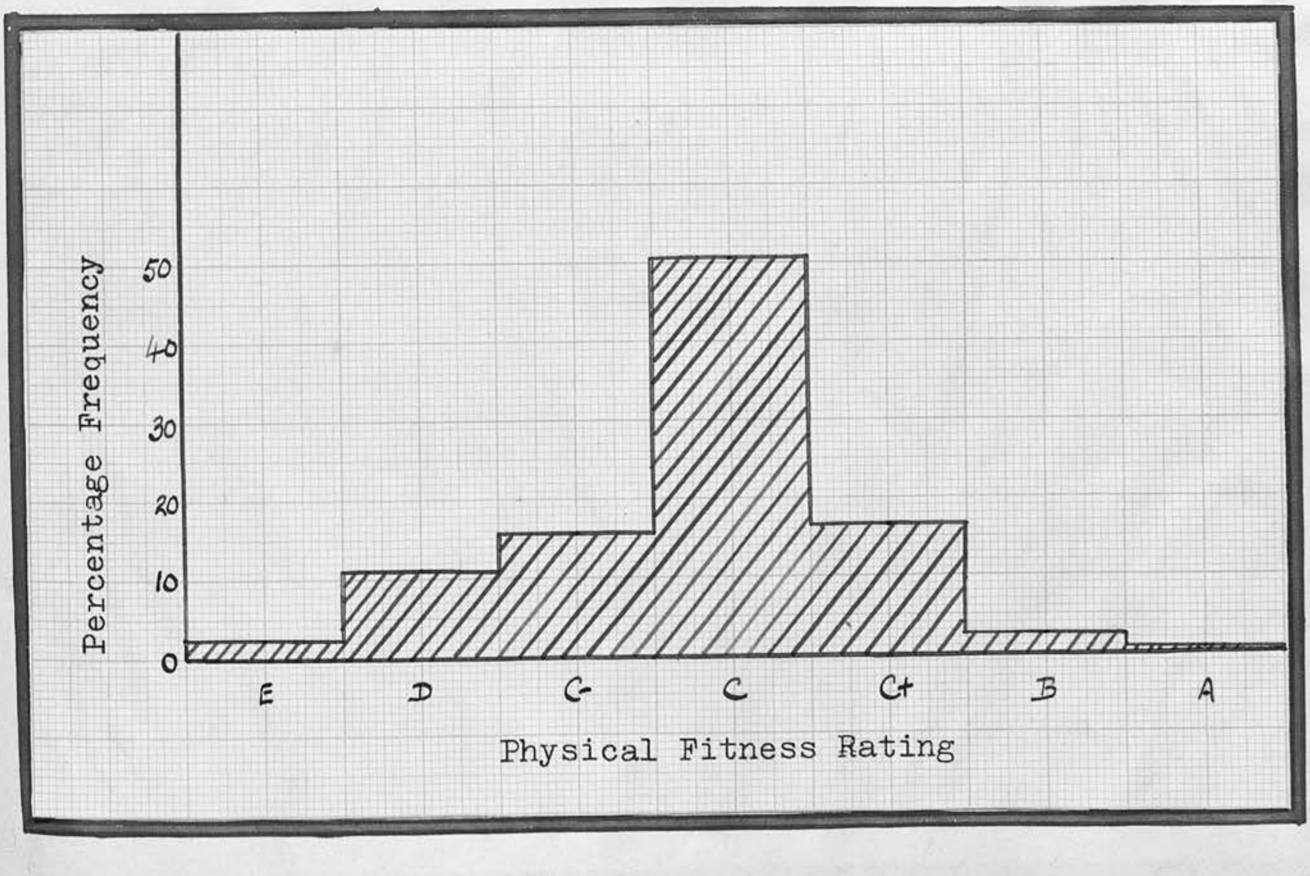


DISTRIBUTION OF PHYSICAL FITNESS RATINGS

(Female)

Table X

Rating	School				Total
	T	B	J.C.	D.K.	
A	-	2	1	-	3
B	8	2	3	-	13
C+	47	15	16	5	83
C	105	71	70	8	254
C-	28	38	9	4	79
D	19	24	9	3	55
E	4	4	4	-	12
	211	156	112	20	499
%	60.0%	68.7%	56.7%	18.7%	56.5%

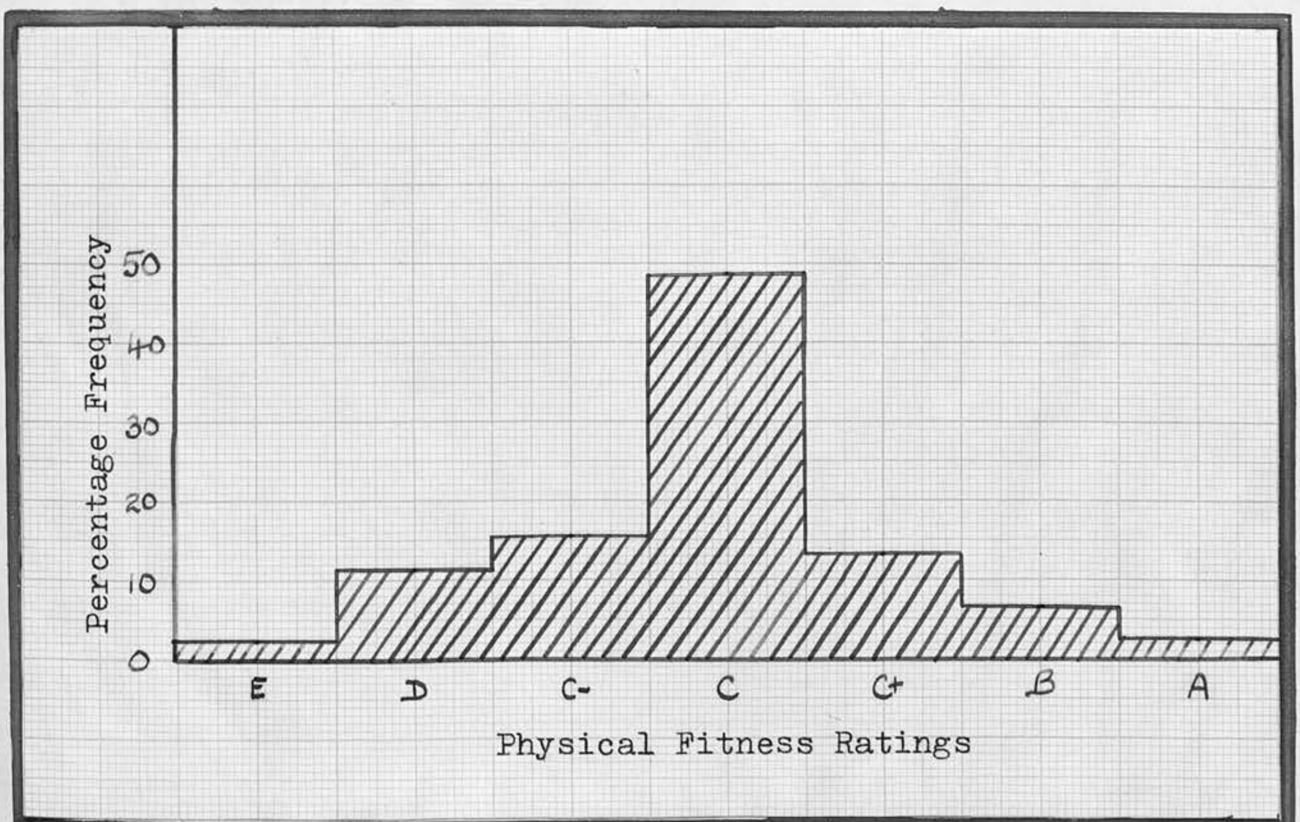


DISTRIBUTION OF PHYSICAL FITNESS RATINGS

(Male and Female)

Table XI

Rating	School T	School B	School J.C.	School D.K.	Total
A	9	4	12	1	26
B	26	11	26	11	74
C+	61	24	40	11	136
C	188	134	158	35	515
C-	65	67	22	9	163
D	43	49	19	7	118
E	8	4	8	3	23
	400	293	285	77	1055
%	57·9%	60·4%	70·7%	29·6%	57·3%



PHYSICAL FITNESS RATINGS EXPRESSED AS PERCENTAGES

Table XII

Grade	Male		Female		Male and Female	
	No.	%	No.	%	No.	%
A	23	4.1	3	.6	26	2.3
B	61	11.0	13	2.6	74	6.8
C+	53	9.5	83	16.6	136	13.1
C	261	47.0	254	50.9	515	48.9
C-	84	15.1	79	15.8	163	15.5
D	63	11.3	55	11.1	118	11.2
E	11	2.0	12	2.4	23	2.2
Totals	556	100.0	499	100.0	1055	100.0

rated b for nutrition, muscular development and vascular tone. Table XII shows the percentage frequencies for the other physical fitness ratings, while the histographic representation of those frequencies appears below Table X. Table XI shows the numerical distribution of the physical fitness ratings for the whole group (male and female), while the histographic representation appears below it on the same page.

These physical fitness ratings have been correlated with (a) linguistic intelligence ratings and with (b) temperament ratings for the total male group, total female group, and the total group (male and female). It should be noted that the temperament ratings as given by the teachers have been used in calculating the coefficient of correlation between physical fitness and temperament. The five-point rating for temperament, as shown in correlation matrices I, II, III, IV, V and VI, has been derived from the 'temperament score' which is fully described in a later chapter.

Male Group

As shown in Matrix I, the coefficient of correlation between linguistic intelligence and physical fitness for this group (556 boys) is .125 ±.028. This correlation coefficient is significant and is greater than that obtained by Earle, who obtained a value of .07 ±.048. The coefficient of correlation between temperament and physical fitness for this group (367 boys, i.e. 556 minus the Tynecastle group of 189 individuals who did not receive School Reports and who, therefore, were not assessed for temperament by their teachers) is .378 ±.030 (see Matrix II). This correlation coefficient is also significant and higher than that obtained by Earle, his value being, .17 ±.042. It is interesting to note that the coefficient of correlation for intelligence and physical fitness and the coefficient of correlation for temperament and physical fitness obtained in this investigation are both approximately twice those obtained in the London scheme. When we come to compare "r" (intelligence and physical fitness) and "r" (temperament and physical fitness), we find that there is quite a definite significant difference between the two. This finding would seem to indicate that temperament is much more closely allied to physical fitness than is intelligence and that the more healthy the individual the more likely is he to possess a stable and well-balanced temperament.

Female Group

As shown in Matrix III, the coefficient of correlation between linguistic intelligence and physical fitness for this group (499 girls) is .161 ±.029. This correlation coefficient is significant and is

MATRIX SHOWING CORRELATION BETWEEN INTELLIGENCE AND PHYSICAL FITNESS

(Male)

Matrix I

Physical Fitness

	E	D	C	B	A	F
A		4	7	4	3	18
B	1	11	92	13	6	123
C	4	32	224	29	13	302
D	4	15	71	13	1	104
E	2	1	4	2		9
F	11	63	398	61	23	556

r = .125

P.E. = ±.028

MATRIX SHOWING CORRELATION BETWEEN TEMPERAMENT AND PHYSICAL FITNESS

(Male)

Matrix II

Physical Fitness

	E	D	C	B	A	F
A		1	1	2	3	7
B		7	34	20	8	69
C	1	19	167	13	3	203
D	2	8	59	8		77
E	4	4	3			11
F	7	39	264	43	14	367

r = .378

P.E. = ±.030

greater than that obtained by Earle, viz. - .02 ±.050. The coefficient of correlation between physical fitness and temperament for this group (288 girls, i.e. 499 minus the Tynecastle group of 211 individuals who did not receive School Reports and who, therefore, were not assessed for temperament by their teachers) is .357 ±.035, Earle's corresponding value being .23 ±.043. As in the male group, there is a significant difference between "r" (physical fitness and intelligence) and "r" (physical fitness and temperament), the difference is however smaller than for the male group. The significance ratios are as follows:-

Male group : $\frac{D}{P.E._d} = 6.17$ Female group : $\frac{D}{P.E._d} = 4.35$.

Table XIIa

	Edinburgh		London	
	$r_{P.I.}$	$r_{P.T.}$	$r_{P.I.}$	$r_{P.T.}$
Male Group	.125 ± .028	.378 ± .030	.070 ± .048	.170 ± .042
Female Group	.161 ± .029	.357 ± .035	-.020 ± .050	.230 ± .043
Total Group	.139 ± .020	.364 ± .023	-	-

Another interesting comparison (see Table XIIa) between Earle's findings and those of this investigation is that "r" (intelligence and physical fitness) is greater in the case of the boys than of the girls in the London scheme, whereas we find that the reverse is the case. He also finds that "r" (temperament and physical fitness) is greater for the boys than for the girls, whereas the reverse is the case in the Edinburgh investigation.

The significance ratio, when applied to the two sets of correlation coefficients, viz. "r" (physical fitness and intelligence) for male and female groups and "r" (physical fitness and temperament) for male

MATRIX SHOWING CORRELATION BETWEEN INTELLIGENCE AND PHYSICAL FITNESS

(Female)

Matrix III

Physical Fitness

	E	D	C	B	A	F
A		2	4	4	2	12
B	1	15	89	6	1	112
C	5	21	223	2		251
D	5	16	98	1		120
E	1	1				4
F	12	55	416	13	3	499

r = .161

P.E. = ±.029

MATRIX SHOWING CORRELATION BETWEEN TEMPERAMENT AND PHYSICAL FITNESS

(Female)

Matrix IV

Physical Fitness

	E	D	C	B	A	F
A			4	4	1	9
B		5	48	1	2	56
C	3	17	142			162
D	4	13	41			58
E	1	1	1			3
F	8	36	236	5	3	288

r = .357

P.E. = ±.035

MATRIX SHOWING CORRELATION BETWEEN INTELLIGENCE AND PHYSICAL FITNESS

(Male and Female)

Physical Fitness

Matrix V

	E	D	C	B	A	D
A		6	11	8	5	30
B	2	26	181	19	7	235
C	9	53	447	31	13	553
D	9	31	169	14	1	224
E	3	2	6	2		13
F	23	118	814	74	26	1055

r = .139

P.E. = ±.020

MATRIX SHOWING CORRELATION BETWEEN TEMPERAMENT AND PHYSICAL FITNESS

(Male and Female)

Physical Fitness

Matrix VI

	E	D	C	B	A	F
A		1	5	6	4	16
B		12	82	21	10	125
C	4	36	309	13	3	365
D	6	21	100	8		135
E	5	5	4			14
F	15	75	500	48	17	655

r = .364

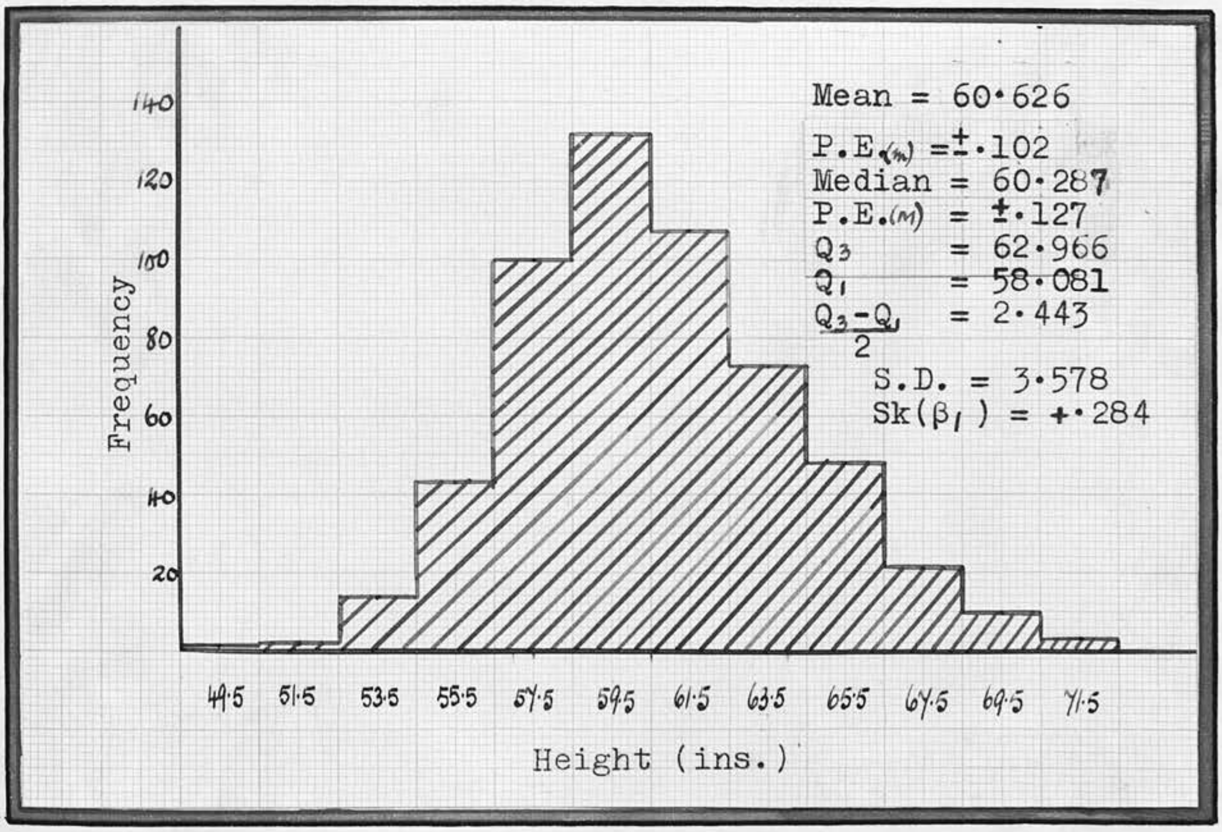
P.E. = ±.023

HEIGHT DISTRIBUTION

(Male)

Table XIII

Height (inches)	School				Total
	T	B	J.C.	D.K.	
71 -	1	-	2	-	3
69 - 70	2	4	-	4	10
67 - 68	4	11	7	-	22
65 - 66	24	15	7	2	48
63 - 64	23	20	23	7	73
61 - 62	39	29	29	11	108
59 - 60	40	30	45	17	132
57 - 58	36	24	33	7	100
55 - 56	16	4	18	5	43
53 - 54	4	-	8	2	14
51 - 52	-	-	-	2	2
- 50	-	-	1	-	1
	189	137	173	57	556



and female groups, reveals no significant sex differences.

Total Group - Male and Female

The coefficient of correlation between intelligence and physical fitness for this group (1055 individuals) is .139 ±.020, as shown in Matrix V. Matrix VI shows that the coefficient of correlation between temperament and physical fitness for this group (655 individuals, i.e. 1055 minus the Tynecastle group of 400) is .364 ±.023.

HEIGHT DISTRIBUTIONS

Male Group

Table XIII shows the height distribution for the various school groups and for the total male group, the histographic representation appearing below on the same page. As shown in Table XIIIa, the mean height for the total group is 60.626 inches with a probable error of ±.102 inches. The standard deviation for the total group is 3.578 inches, while β_1, the measure of skewness, is positive for this distribution.

TABLE XIIIa

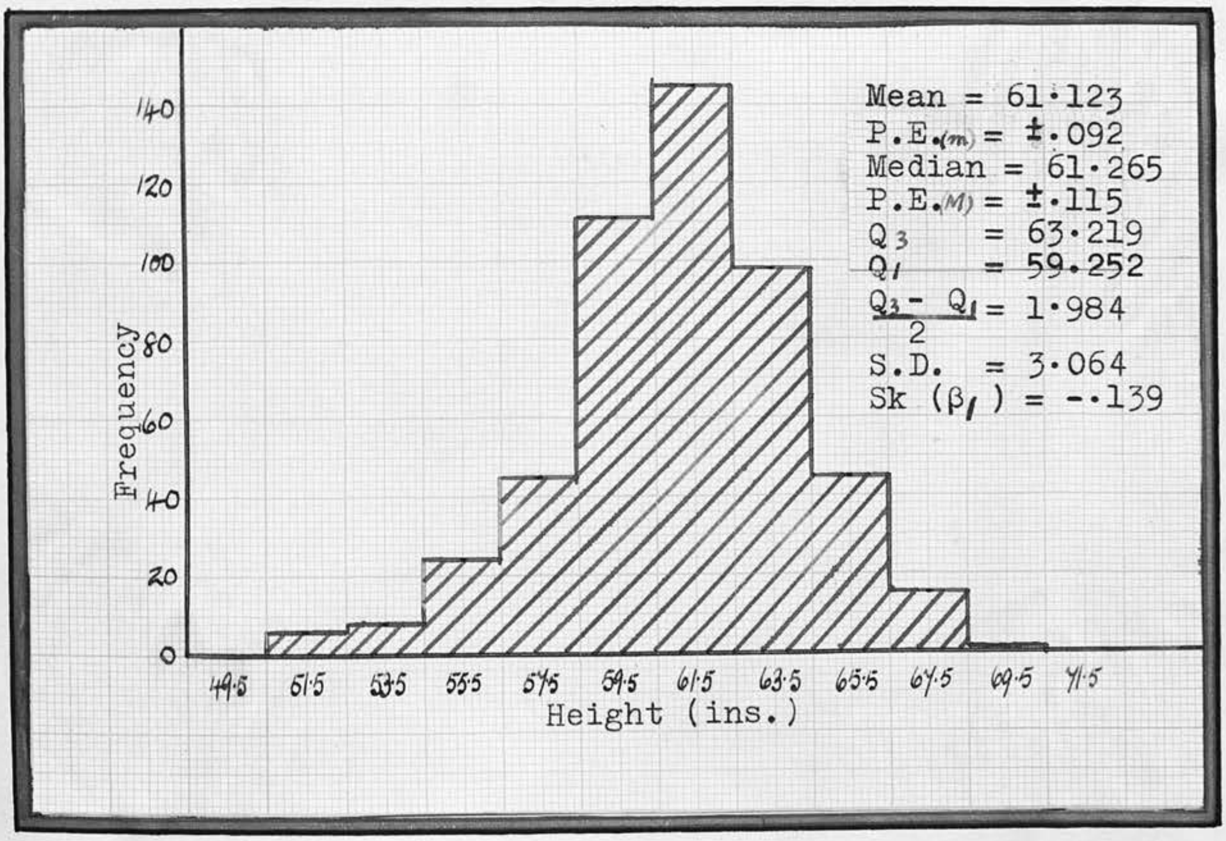
Mean..........................	60.626
Probable error (mean).........	±.102
Median........................	60.287
Probable error (median).......	±.127
Upper quartile (Q_3)..........	62.966
Lower quartile (Q_1)..........	58.081
Semi-interquartile range......	2.443
Standard deviation............	3.578
Skewness (β_1)................	+.284

HEIGHT DISTRIBUTION

(Female)

Table XIV

Height (inches)	School				Total
	T	B	J.C.	D.K.	
71 -	-	-	-	-	-
69 - 70	1	-	1	-	2
67 - 68	5	8	2	-	15
65 - 66	9	27	5	4	45
63 - 64	29	47	21	1	98
61 - 62	66	43	29	7	145
59 - 60	53	21	34	3	111
57 - 58	26	8	10	1	45
55 - 56	13	1	7	3	24
53 - 54	5	1	2	-	8
51 - 52	4	-	1	1	6
- 50	-	-	-	-	-
	211	156	112	20	499



Female Group

Table XIV shows the height distribution for the various school groups and for the total female group, while the histographic representation of the height frequency for the total female group appears below on the same page. As shown in Table XIVa, the mean height for the total group is 61.123 inches with a probable error of ±.092 inches. The standard deviation for the total group is 3.064 inches while the measure of skewness is negative for this distribution.

Table XIVa

Mean........................	61.123
Probable error (mean).........	±.092
Median......................	61.265
Probable error (median).......	±.115
Upper quartile (Q_3)..........	63.219
Lower quartile (Q_1)..........	59.252
Semi-interquartile range......	1.984
Standard deviation...........	3.064
Skewness (β_1)................	-.139

In order to ascertain whether the difference between the mean of the height distribution (male) and the mean of the height distribution (female) is significant or not, the usual significance ratio is employed, and it is found that the difference between the two means is not statistically significant. The value of the significance ratio $\frac{D}{\sigma_d}$ is 2.488.

Total Group - Male and Female

Table XV shows the height distribution for the total group

HEIGHT DISTRIBUTION

(Male and Female)

Table XV

Height (inches)	School T	B	J.C.	D.K.	Total
71 -	1	-	2	-	3
69 - 70	3	4	1	4	12
67 - 68	9	19	9	-	37
65 - 66	33	42	12	6	93
63 - 64	52	67	44	8	171
61 - 62	105	72	58	18	253
59 - 60	93	51	79	20	243
57 - 58	62	32	43	8	145
55 - 56	29	5	25	8	67
53 - 54	9	1	10	2	22
51 - 52	4	-	1	3	8
- 50	-	-	1	-	1
	400	293	285	77	1055

Table XVa

Mean........................ 60.861

Probable error (mean)......... $\pm$.070

Median........................ 60.828

Probable error (median)....... $\pm$.087

Upper quartile (Q_3).......... 63.111

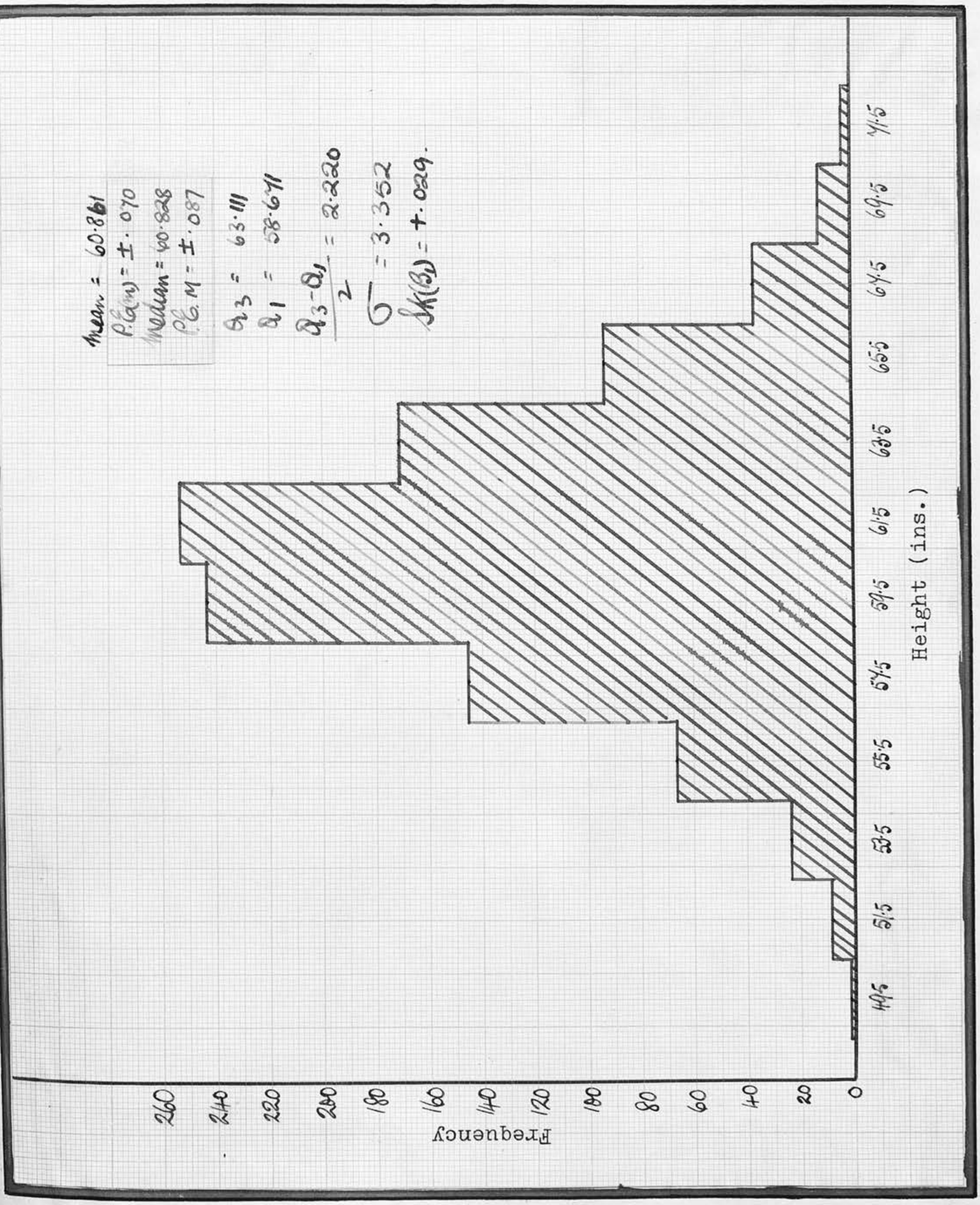
Lower quartile (Q_1).......... 58.671

Semi-interquartile range...... 2.220

Standard deviation........... 3.352

Skewness (β_1)................ +.029

HISTOGRAM OF DATA CONTAINED IN TABLE XV

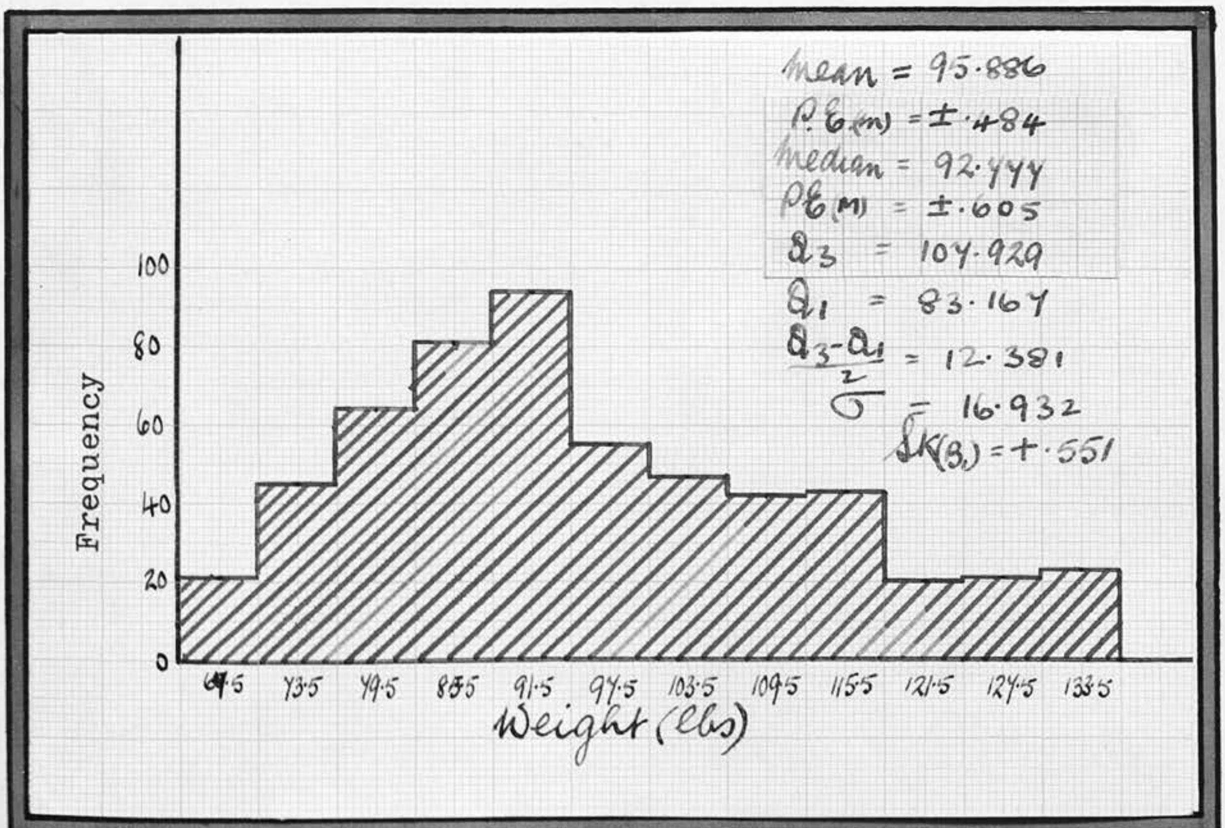


WEIGHT DISTRIBUTION

(Male)

Table XVI

Weight (lbs)	School				Total
	T	B	J.C.	D.K.	
131 -	7	9	5	2	23
125 - 130	6	6	6	3	21
119 - 124	6	10	4	-	20
113 - 118	17	9	15	2	43
107 - 112	13	13	11	5	42
101 - 106	15	10	17	5	47
95 - 100	21	14	12	8	55
89 - 94	35	24	24	11	94
83 - 88	17	23	34	7	81
77 - 82	28	10	20	6	64
71 - 76	17	7	17	4	45
- 70	7	2	8	4	21
	189	137	173	57	556



(male and female), its histographic representation appearing on the following page. As shown in Table XVa, the mean height for the group is 60.861 inches with a probable error of ±.070 inches. The standard deviation for the distribution is 3.352, while the measure of skewness is slightly positive.

WEIGHT DISTRIBUTIONS

Male Group

Table XVI shows the weight distribution for the various school groups and for the total male group, while the histographic representation of the distribution appears below on the same page. As shown in Table XVIa, the mean weight for the total group is 95.886 lbs. with a probable error of ±.484 lbs. The standard deviation for the distribution is 16.932 lbs., while the measure of skewness is decidly positive, having a value of +.551.

Table XVIa

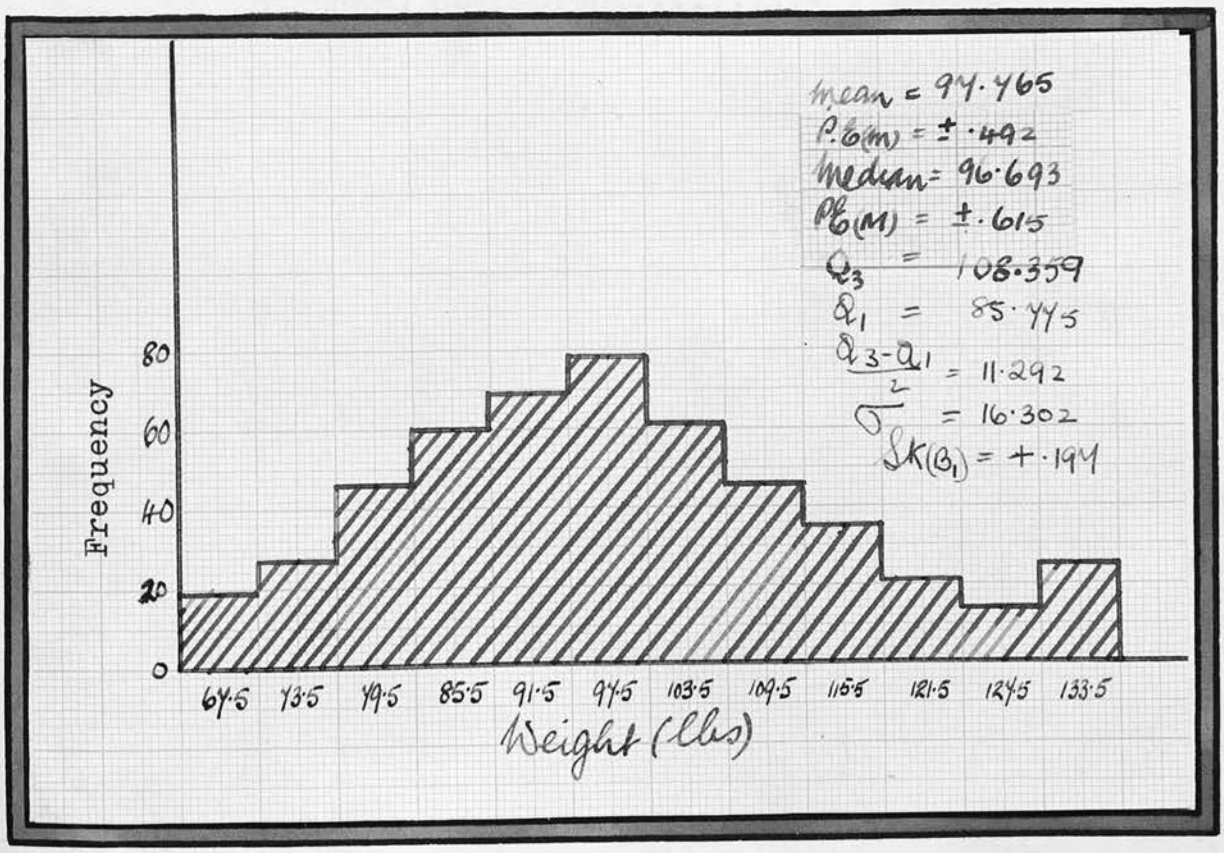
Mean........................	95.886
Probable error (mean)........	±.484
Median......................	92.777
Probable error (median)......	±.605
Upper quartile (Q_3)..........	107.929
Lower quartile (Q_1)..........	83.167
Semi-interquartile range.....	12.381
Standard deviation...........	16.932
Skewness (β_1)................	+.551

WEIGHT DISTRIBUTION

(Female)

Table XVII

Weight (lbs)	School				Total
	T	B	J.C.	D.K.	
131 -	10	10	4	1	25
125 - 130	5	4	2	1	12
119 - 124	8	8	3	2	21
113 - 118	10	18	6	1	35
107 - 112	11	21	11	3	46
101 - 106	27	24	9	1	61
95 - 100	37	23	15	3	78
89 - 94	32	21	15	1	69
83 - 88	22	12	22	4	60
77 - 82	20	11	14	1	46
71 - 76	15	3	8	1	27
- 70	14	1	3	1	19
	211	156	112	20	499



Female Group

Table XVII shows the weight distribution for the various school groups and for the total female group, its histographic representation appearing below on the same page. Table XVIIa shows that the mean weight for the group is 97.765 lbs., the probable error of the mean being $\pm .492$ lbs. The standard deviation for the group is 16.302 lbs., while the measure of skewness has a value of +.197.

Table XVIIa

Mean........................	97.765
Probable error (mean)........	$\pm .492$
Median......................	96.693
Probable error (median)......	$\pm .615$
Upper quartile (Q_3).........	108.359
Lower quartile (Q_1).........	85.775
Semi-interquartile range.....	11.292
Standard deviation..........	16.302
Skewness (β_1)...............	+.197

Despite the fact that the girls are, on the average, 1.879 lbs. heavier than the boys of a similar age, the difference is not statistically significant, the significance ratio $\frac{D}{\sigma_d}$ having a value of 1.837.

Total Group - Male and Female

Table XVIII shows the weight distribution for the total group (male and female), its histographic representation appearing on the following page. The mean weight for the group is 96.772 lbs. with a probable error of $\pm .346$ lbs. The standard deviation for the distribution is 16.662 lbs., while β_1 has a value of $\pm .397$.

WEIGHT DISTRIBUTION

(Male and Female)

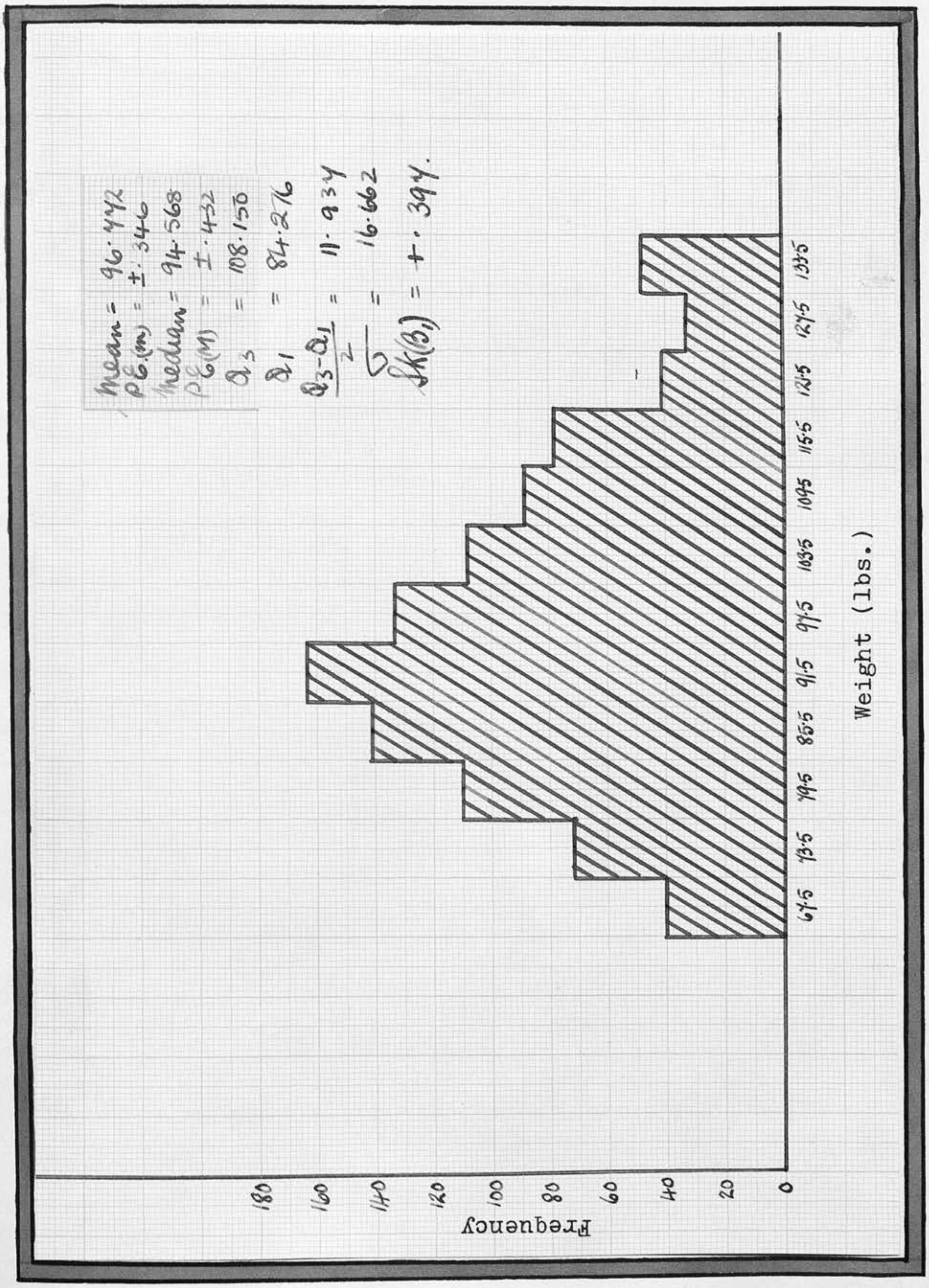
Table XVIII

Weight (lbs)	School T	School B	School J.C.	School D.K.	Total
131 -	17	19	9	3	48
125 - 130	11	10	8	4	33
119 - 124	14	18	7	2	41
113 - 118	27	27	21	3	78
107 - 112	24	34	22	8	88
101 - 106	42	34	26	6	108
95 - 100	58	37	27	11	133
89 - 94	67	45	39	12	163
83 - 88	39	35	56	11	141
77 - 82	48	21	34	7	110
71 - 76	32	10	25	5	72
- 70	21	3	11	5	40
	400	293	285	77	1055

Table XVIIIa

Mean....................	96.772
Probable error..........	$\pm$.346
Median..................	94.568
Probable error (median).	$\pm$.432
Upper quartile (Q_3).....	108.150
Lower quartile (Q_1).....	84.276
Semi-interquartile range	11.937
Standard deviation......	16.662
Skewness (β_1)...........	+.397

HISTOGRAM OF DATA CONTAINED IN TABLE XVIII



Correlation coefficients between the height and weight distributions have been calculated for (a) male group, (b) female group and (c) total group

Male Group

As shown in Matrix VII, the correlation coefficient for "Height v Weight" has a value of .827 ±.009.

Female Group

As shown in Matrix VIII, the correlation coefficient for "Height v Weight" for this group is .696 ±.016.

When we come to apply the significance formula, we find that there is a significant difference between the sexes. The significance ratio $\frac{D}{P.E._d}$ has a value of 7.278. This finding would seem to indicate that there is a much closer correspondence between height and weight for the boys than for the girls. This is probably due to the fact that girls may enter the adolescent phase at an earlier stage than boys of a similar age with the result that height may not develop pari-passu with weight and vice-versa.

Total Group - Male and Female

Matrix IX shows that "r" (Height v Weight) is .771 with a probable error of ±.008.

MATRIX SHOWING CORRELATION BETWEEN HEIGHT AND WEIGHT

(Male)

(Weight in lbs.) Matrix VII

	-70	71-76	77-82	83-88	89-94	95-100	101-106	107-112	113-118	119-124	125-130	131-	F
71-				1								2	3
69-70		1							1		2	6	10
67-68								1	2	6	8	5	22
65-66						2	5	7	16	7	7	4	48
63-64				2	1	14	17	15	13	4	4	3	73
61-62				13	27	21	21	14	8	2		2	108
59-60	2	6	14	34	47	18	4	5	1	1			132
57-58	2	17	33	29	17				2				100
55-56	7	16	16	2	2								43
53-54	7	5	1									1	14
51-52	2												2
-50	1												1
F	21	45	64	81	94	55	47	42	43	20	21	23	556

Coefficient of correlation = .827

Probable error (r) = $\pm$.009

MATRIX SHOWING CORRELATION BETWEEN HEIGHT AND WEIGHT

(Female)

(Weight in lbs.) Matrix VIII

	-70	71-76	77-82	83-88	89-94	95-100	101-106	107-112	113-118	119-124	125-130	131-	F
71-													-
69-70						1						1	2
67-78								6	4	2	2	1	15
65-66					1	6	7	3	9	6	2	11	45
63-64				2	8	19	19	18	14	8	3	7	98
61-62	1	2	6	19	26	35	23	15	5	5	5	3	145
59-60		9	18	31	23	12	11	4	1			2	111
57-58	3	6	18	2	11	3	1		1				45
55-56	7	8	3	5		1							24
53-54	5	2		1									8
51-52	3		1			1			1				6
-50													-
F	19	27	46	60	69	78	61	46	35	21	12	25	499

Coefficient of correlation = .696

Probable error (r) = ±.016

MATRIX SHOWING CORRELATION BETWEEN HEIGHT AND WEIGHT

(Male and Female)

(Weight in lbs.) Matrix IX

	-70	71-76	77-82	83-88	89-94	95-100	101-106	107-112	113-118	119-124	125-130	131-	
71-				1								2	3
69-70		1				1			1		2	7	12
67-68								7	6	8	10	6	37
65-66					1	8	12	10	25	13	9	15	93
63-64				4	9	33	36	33	27	12	7	10	171
61-62	1	2	6	32	53	56	44	29	13	7	5	5	253
59-60	2	15	32	65	70	30	15	9	2	1		2	243
57-58	5	23	51	31	28	3	1		3				145
55-56	14	24	19	7	2	1							67
53-54	12	7	1	1								1	22
51-52	5		1			1			1				8
-50	1												1
F	40	72	110	141	163	133	108	88	78	41	33	48	1055

Coefficient of correlation = .771

Probable error (r) = $\pm$.008

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Chapter 7

PERSONALITY, TEMPERAMENT, AND CHARACTER IN RELATION TO VOCATIONAL GUIDANCE

"Intelligence tests have made a large contribution to the analysis of the capacity of pupils to do school work. The scores on intelligence tests have a fair correlation with the achievement of pupils in their courses. The correlation is very far from perfect, and there is clear evidence that the comparatively low correlation is due, not simply to errors in the measurement of intelligence and achievement, but also to the presence of other factors in achievement besides intelligence. An attempt to explain the discrepancy between intelligence and achievement in individual cases frequently brings convincing evidence that this discrepancy is due to some characteristic of the individual's temperament rather than to his intellectual capacity. A complete measurement of the factors in school work, or in achievement in general, therefore, must include other traits besides intelligence. These other traits have been loosely grouped under the general head of '**personality**'".

Freeman, "Mental Tests", 1926.

It is generally realised by most vocational guidance psychologists that temperament and character traits are of as much importance in determining an individual's occupational happiness as are his mental abilities and physical qualities. The intelligence test and the various tests of special ability, which compose the test battery in a scheme of vocational guidance, give us information regarding an individual's performance during a period of maximum effort. Information of this nature, therefore, affords us with a knowledge of the probable upper limit of his future achievement. According to Earle (1), "such information indicates what a person *can* do, but gives no information of what he *will* do." Herein lies the crux of the matter, and the importance of a scientific study of temperamental qualities is, therefore, clearly evident. But before proceeding to the consideration of the assessment of temperamental qualities, let us try to together into some sort of provisional order the facts of personality, temperament, and character.

According to Warren (2), "personality must be regarded as a psychophysical concept." The double aspect theory of mind-body relationship gives us a clue as to the psychophysical nature of personality. On the one hand, personality can be 'viewed' by the 'behaving subject' as consciousness, and on the other, as the body with its accompanying responses by the external observer. It must be remembered, however, that personality is not two-fold in its ultimate nature, since consciousness and bodily response are subjective and objective aspects of the same thing.

Personality can also be regarded as consisting of three essential elements, (a) the cognitive, (b) the affective, and (c) the conative. On the cognitive side of personality, we have the sensory response; on the affective side, we have the response of the autonomic system; while on the conative side, we have the responses of the neuro-muscular system. The constitution of the personality on this view is acknowledged by the majority of psychologists, and it is generally held that the cognitive and affective elements of the personality are known to us subjectively, while its conative aspect is known to us objectively in terms of behaviour.

In the third place, psychologists hold that some of the elements which compose the personality are innate and that some are acquired. Most authorities on the subject are in agreement that the original elements, on the cognitive side, are probably sensation and image, while the more complex and acquired elements are perception, memory, association, judgment, reasoning, etc. The components of the affective side of the personality are the simple emotions which, according to McDougall,(3) "are associated with their corresponding instinctive impulses"; the acquired or derived components of the personality, on the affective side, are the complex emotions, moods, sentiments, etc. The innate elements of the conative aspect of the personality are much more easily recognisable. They are the reflex actions, instinctive responses and random movements; while the acquired elements of the conative aspect are habits of skill, social habits, and the acquired co-ordinated and conditioned impulses which motivate our behaviour. In this view of the personality, it will be noted that instinct and emotion are classified as different aspects. Objectively considered, instinct is the response of the neuro-muscular system, while emotion is the response of the autonomic system; while from a subjective point of view, instinct is experienced as an impulse, drive, or urge, whereas emotion is consciousness in its dynamic aspect, an aspect which is analysable into various diffuse organic sensations and feelings of differing qualities. McDougall (op. cit.) sheds some further light on this topic. He points out that we require the terms "disposition", "temperament", and "character", in order that we can distinguish the three directions in which individuals may differ a great deal from one another, even although they may have inherited the same instinctive dispositions, the same degree and type of intelligence, and have enjoyed the same environmental and educational influences. In dealing with the personality as a whole, McDougall distinguishes between "disposition", which corresponds to the sum total of an individual's instinctive tendencies and is determined by heredity; "temperament", which is the sum total of the effects upon the individual's mental life of the metabolic changes which occur in his body; and "character" which is the sum total of the acquired tendencies built upon the basis of disposition and temperament.

Personality may also be considered from the point of view of intelligence. There would seem to be three types of intelligence, (a) cognitive intelligence, (b) affective intelligence, and (c) conative or /

motor intelligence. By cognitive intelligence is meant the cognitive learning capacity, i.e. the capacity to acquire ideas and ideational associations and the capacity to analyse them into some ordered form; by affective intelligence is meant the affective learning capacity to condition, modify, and combine feelings and emotions and to develop sentiments; and by conative intelligence we mean motor learning capacity or the capacity to condition reflexes and instinctive tendencies, to co-ordinate motor responses into habits, and to acquire technical skill.

In the organised personality, associative bonds are formed between relatively simple elements of the mental life, and then these components are formed into a hierarchy of still more complex organisations. This organisation depends essentially upon three factors, (a) the existence of the innate aspects of the personality, such as sensations, instincts, and reflex actions, (b) the innate constituents of intelligence, (c) environmental influences, such as education, the home, technical training, etc. These three factors are necessary for each type of organisation, whether it be, cognitive, affective, or conative.

The organisation of the personality, on the cognitive side, may begin with simple sensations and images; these are in turn organised into perceptions and ideas; and these are further organised into systems of knowledge. The complete organisation of the cognitive elements of the personality has been called "intellect" to distinguish it from native intelligence which must be present as an original element of the individual's make-up.

The organisation of the personality, on the affective side, commences with simple feelings and simple emotions, those in turn are modified, conditioned, and organised into the complex emotions, affective attitudes, moods, snetiments, interests, and aversions. The sentiments and other complex emotional elements may be further organised into a mass or major sentiment, e.g. loyalty. Most psychologists realise the complexity of the affective aspect of personality and hold that its organisation isnever so complete as that of the cognitive organisation. The relative instability of the affective organisation of personality has been a cource of much speculation among psychologists, and many theories have been offered as explanations of this instability. Kirkpatrick (4) emphasises this particular point when he says that, "affective organisation corresponds to the gathering up of the scattered threads of instinctive and impulsive desire, and weaving them into the single skein of a rational whole". The degree of rationality and completeness of this affective organisation does, of course, depend largely on the influence of environment. The close interdependence of the social organisation and the affective organisation is summarisd by Gillette (5) thus: "By socialisation, in general, is meant the process by which an individual.....isbrought into conformity and co-operation with human society in its dominant interest and fundamental nature". Angell (6) also stresses this point: "The slightest consideration of the human mind reveals it to be replete with instincts and impulses, which are not only social in their effect, but which would be absolutely devoid of meaning were this social character withdrawn from them". So essential, therefore, is the socialising function of environment on the stability of the affective organisation of the personality that the vocational guidance psychologist is compelled to realise the grave consequences to an individual of temperamental maladjustment in an occupation. The complete organisation of the affective elements in personality may be called "temperament". Temperament is therefore the total affective make-up of the individual, and includes innate affective elements, and the co-ordination and organisation of those elements which have been acquired as a result of environmental influences.

The organisation of the personality, on the conative side, begins with the simple instinctive tendencies and reflex actions which, in turn, are conditioned, modified, and integrated into more and more complex impulses. These are, inturn, co-ordinated into motor attitudes and habits, such as the habits of work and play, technical habits, and social habits. The final organisation of those habits and their correlated impulses leads to the formation of a general conative attitude, which we may call "character". Character, from this point of view, is the organisation of innate conative elements and conative intelligence due to the influence of environment and training. This conception of character will perhaps be more readily accepted, if we pause for a moment to reflect upon the psychological nature of the sentiment. According to Shand (7), a sentiment is defined as "an organised system of emotional tendencies centred about some object." According to McDougall (8) "Typical sentiments, such as love and hate, are not merely emotions but enduring tendencies to experience certain emotions whenever the loved or hated object comes to mind..... When a man has acquired the sentiment of love for a person or object, he is apt to experience tender emotion in its presence, fear or anxiety when it is in danger, anger when it is threatened, sorrow when it is lost, joy when the object prospers or is restored to him, gratitude towards him who does good to it, and so on; and, when he hates a person, he experiences fear or anger or both on his approach, joy when that other is injured, anger when he receives favours." An individual, therefore, in the course of his development from childhood, through adolescence, to manhood, acquires sentiments of liking or disliking not only for persons and things, but also for moral qualities such as loyalty and honesty. These 'minor' sentiments are then organised into the 'major' sentiment of "self-respect" and it the dominance of this sentiment that is the essential element in his "strength of will". "Self-respect", according to McDougall (9), "is the flywheel of character, the regulator of conduct, the supreme arbiter in all moral deliberation; its desire to be and do the right thing becomes the decisive factor in all moral choice and true volition".

The constitution of the personality, as just described, varies enormously from individual to individual, and the vocational guidance psychologist must take cognisance of this fact since the personality of the individual is of such vital significance in the world of industry. As we have already found, some of the individual differences in personality are due to (a) differences in the number and strength of the innate elements which go to form the personality, (b) differences in cognitive, affective, and motor intelligence, (c) differences in environmental influence. There are, however, other individual differences in personality which merit our attention.

In the first place, there may be individual differences in the complexity of the personality. We have already seen that the personality consists of three components, viz. intellect, temperament, and character. It may be noted here that personality is used in the sense of Roback's (10) definition to include intellectual, temperamental and character traits. It is not used with the narrower meaning, given to it by some psychologists, as merely a synonym for temperament and character. Bearing this in mind, we see, therefore, that an individual may possess much or little knowledge, few or many sentiments and interests, and he may lack or be well equipped with technical and social skills. Individual differences in the complexity of the personality are, therefore, due to (a) breadth of knowledge, (b) diversity of interests and sentiments, and (c) multiplicity of skills and variety of social behaviour.

In the second place, there may be individual differences in the degree of integration of the personality. None of us, in the strict sense, have a complete and integrated personality but possess, rather, personalities which show divers degrees of integration. Watson (11) defines personality as "an individual's total assets (actual and potential) and liabilities (actual and potential) on the reaction side." "Assets are that part of the individual's equipment which make for his adjustment and balance in his present environment and for readjustment if the environment changes. By liabilities we mean similarly that part of the individual's equipment which does not work in the present environment and the potential or possible factors which would prevent his rising to meet a changed environment." Such a definition, though strictly behaviouristic in standpoint, seeks to emphasise the importance of an individual's having more 'assets' than 'liabilities', if his personality is to be normal and well integrated. In the case of the individual whose 'liabilities' outnumber his 'assets', the inadequate functioning of the integrative process is due primarily to his having acquired responses which lead to a maladjustment to his environment. Maladjustment to an environment, especially if occupational, is of the greatest significance to the vocational guidance psychologist owing to the far-reaching consequences which it may have on the individual's personality. The mental conflict, which usually accompanies this maladjustment, is a problem of the greatest gravity, since the dissociation caused by it may occur in the realm of cognition, affection, or conation. Without going further into this question of the dissociation of the personality into other sub-systems, we realise that the three aspects of personality, viz. intellect, temperament and character must be intimately related, if the personality is to possess unity and strength. The organisation of the personality into its final form may be a long process, yet its strength is judged only on the intimate integration of its components.

A third way in which individuals may differ from one another is in the "balance of personality". A balanced personality may be defined as one in which intellect, temperament and character are equally well developed and organised. Freud (12), Kempf (13), Dooley (14), and Moore (15) in their personality studies of Leonardo da Vinci, Charles Darwin, Charlotte Bronte, and Percy Bysshe Shelley stress this particular individual difference. Day in, day out, we meet individuals in whom intellect is the dominant and prevailing factor, others in whom the affective factor in personality is most highly developed, and still others in whom the conative organisation reigns supreme. In the first group we have the 'intellectualists' whose personalities are rather unilateral, since for them systems of knowledge are of paramount importance with the result that the affective and conative elements are repressed and pushed into the background. In the second group we have those whose sentiments are over-developed with the result that their behaviour is marked by arather abnormal enthusiasm for anything that may interest them, these are the 'sentimentalists'. While in the third group we find individuals whose behaviour is characterised by the preponderance of the conative aspect of their personalities, these are the 'energetic men of action'. It would therefore seem that intellect, temperament and character must be equally well developed and organised if we areto say that an individual has a balanced personality, and when we consider personality in relation to the occupational environment we cannot be but impressed by the fact that it is the individual possessing the balanced personality who is of the greatest utility, both socially and industrially.

In the fourth place, there may be individual differences in the "mode of expression" of the personality. Allport (16) has stated that "the mode of expression is dependent upon the direction of attention, the nature of the dominating ideal and major sentiment, early environmental influences and training, and heredity. In its mode of expression the personality may belong to either the introvert type or the extravert type, it may be egotistic or altruistic, it may be primitive, sublimated, repressed, or dissociated." The concept of the personality as being a series of effects produced by a given individual on others, is the popular one. We frequently find the personality of an individual being described as 'strong','magnetic','pleasing','forceful', etc. This is the view held by Dunlap (17) who states "the self of one individual, in so far as it is experienced by another individual, or in so far as it is estimated by another, is properly designated as 'personality'". This is a somewhat narrow definition of personality since it fails to realise the importance of other constitutents in the personality which we know to be present and which are given their due weight in the summarised definition in the following paragraph.

We have now collated a fair number of facts concerning the nature of personality, temperament and character, now let us formulate as ~~comphrensive~~ comprehensive a definition of personality as is possible in light of the above facts.

(a) Personality is a psycho-physical concept, in other words personality has both mental and physical aspects.

(b) Personality is the sum total and the organisation of correlated mental and physical factors, some of which are innate and some of which are acquired.

(c) Personality is composed of three intimately related aspects of the mental life - the cognitive, affective, and conative aspects.

(d) Each one of these aspects undergoes a fundamentally similar type of organisation, integration, and development which is dependent upon several factors:- (i) the existence of innate cognitive, affective, and conative elements, (ii) innate intelligence and learning capacity whether it be cognitive, affective, or conative, and (iii) environmental influences.

(e) The cognitive organisation of the personality is called the "intellect", the affective organisation, the "temperament"; and the conative organisation, "character".

(f) Personality may vary with reference to its compnnents, its integration, the dominance of itsconstitututents, and its mode of expression.

We now come to the consideration of the question: How can we best assess personality, temperament and character? According to Burt (18), "temperament is always more difficult to assess than intelligence. Intellectual qualities are relatively constant. Emotional qualities are evanescent - hard to seize, and harder still to measure." Many attempts have been made to measure temperament and character objectively, notably by Bernreuter (19), Strong (20), Fryer (21), Pressey(22) and Downey(23). All of these attempts, however, must still be regarded asbeing in the realm of experimental development. Burt (24) is of the opinion that "tests of temperament are neither exact enough nor self-consistent enough to be of much practical service. Their validity is roughly on a level with that of intelligence tests fifteen or twenty years ago. Their self-consistency and accuracy are sufficiently promising to make further theoretical research upon their nature eminently worthwhile, but are not sufficiently high to warrant the immediate application of such methods to problems of vocational guidance. In assessing temperament, therefore, we must fall back upon the method of observation in place of the method of experiment. The personal interview is one recognised device; and another is the collation of reports submitted by competent observers who have been acquainted with the examinee during a long portion of thislife."

So that until better objective techniques of assessing temperament and character have been developed we must, therefore, pin our faith on the traditional methods of observation and report.

In the estimation of temperament we have used, with certain minor modifications, the technique adopted by Earle (op. cit.). A temperament-rating schedule was included in both School and Home Reports, the teachers and parents being supplied with comprehensive definitions of the traits which they were asked to assess. In order to test the validity of this method of assessing temperament, we have correlated teachers' estimates and parents' estimates for the twenty-one traits listed in the schedule. Matrices I to XXI show the degree of correlation of these estimates for the male group (250 individuals), matrices XXII to XLII for the female group (250 individuals), andmatrices XLIII to LXIII for the total group (500 individuals). It should be observed, at this point, that the parents' estimates of temperament for the individuals in the various groups have been fairly rigidly selected. We had to convince ourselves that (1) the parents knew exactly what was required of them in completing the schedule, (2) they understood the definitions of the traits contained in the schedule, and (3) their assessments were fair and unbiassed. We often found, for example, that a schedule would be returned with all the <u>a</u>'s encircled or with all the <u>e</u>'s encircled, needless to say such schedules were cast aside as practically worthless. Of the 1504 temperament schedules returned by parents, we have used 500 of these in the computation of correlation coefficients. It must not, however, be assumed from the above that approximately two-thirds of the parents' estimates were invalid, the percentage of invalid returns is rather in the neighbourhood of 15%. The sample of five hundred individuals has been chosen simply because it is representative of the total group and because /

because it (N = 500) facilitates the computation of the correlation coefficients.

Tables I, II and III (see pages 152, 160, and 168 respectively) show how the twenty-one correlation coefficients between teachers' estimates and parents' estimates are arranged in order of magnitude. Table I shows that, for the male group, the correlation coefficients range from .884 ±.009 to .582 ±.028; Table II shows that the range for the female group is from .834 ±.013 to .594 ±.028; and Table III shows that the range for the total group is from .860 ±.008 to .587 ±.020. The average correlation coefficient for the male group is .704 ±.021, .720 ±.020 for the female group, and .712 ±.015 for the total group.

A survey of the contents of Tables I, II and III reveals the very important fact that certain temperament traits can be assessed with far greater ease than can others. In fact these Tables show us the degree of difficulty of assessing the various traits, a high correlation coefficient corresponding to a trait which is easily assessed, while a low correlation coefficient denotes a trait which is difficult to assess. Burt (op. cit.) carried out an essentially similar investigation in his London Experiment and we can confirm most of his findings. It should be noted, however, that his group was very much smaller than the one used in the present investigation, and that our correlation coefficients are, on the average, much higher and more statistically significant. An analysis of the data in these Tables tends to demonstrate that:-

(a) primary temperament traits can be assessed with greater ease than can those of a secondary and more complex nature.

(b) temperament traits which are predominantly affective in their constitution can be assessed easily.

(c) temperament traits that are excited by social relationships are fairly easy to assess.

(d) temperament traits, in which a moral quality predominates, are not easy to assess.

(e) temperament traits, the assessment of which depends on indirect inference rather than on direct observation, are not easy to assess.

We now come to consider the sex differences which exist between the coefficient of correlation (Teachers' Estimates v Parents' Estimates) for the male group and the coefficient of correlation (Teachers' Estimates v Parents' Estimates) for the female group in respect of specific traits. Let us assume that, for the sake of brevity, "r" is equivalent to "the coefficient of correlation between teachers' estimates and parents' estimates".

TENDERNESS

Matrix XVIII shows that "r" for the male group is .884 ±.009 and Matrix XXXIX showsthat the corresponding "r" for the female group is .834 ±.013.

Sex differences:- There is a significant sex difference between these two correlation coefficients, the significance ratio having a value of 3.125. It is easier, therefore, to assess boys for tenderness than girls.

Matrix LX shows that "r" for the total group is .860 ±.008.

GENERAL EMOTIONALITY

Matrix XXI shows that "r" for the male group is .815 ±.014, while Matrix XLII shows the corresponding "r" for the female group is .800 ±.014.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix LXIII shows that "r" for the total group is .806 ±.011.

SOCIABILITY

Matrix shows that "r" for the male group is .789 ±.016 and Matrix XXXVIII shows that the corresponding "r" for the female group is .772 ±.016.

Sex differences:- There is no significant difference between these two correlation coefficients.

Matrix LIX shows that "r" for the total group is .781 ±.012.

FEARLESSNESS

Matrix XIX shows that "r" for the male group is .788 ±.016, while Matrix XL shows that the corresponding "r" for the female group is .802 ±.015.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix LXI shows that "r" for the total group is .796 ±.011.

ALERTNESS

Matrix VII shows that "r" for the male group is .739 ±.019, while Matrix XXVIII shows the corresponding "r" for the female group to be .722 ±.020.

Sex differences:- There is no significant difference between these two correlation coefficients.

Matrix XLIX shows that "r" for the total group is .730 ±.014.

ASSERTIVENESS

Matrix I shows that "r" for the male group is .722 ±.020 and Matrix XXII shows that the corresponding "r" for the female group is .747 ±.019.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix XLIII shows that "r" for the total group is .738 ±.014.

ENERGY

Matrix XII shows that "r" for the male group is .722 ±.020 and Matrix XXXIII shows that the corresponding "r" for the female group is .738 ±.019.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix LIV shows that "r" for the total group is .730 ±.014.

CO-OPERATIVENESS

Matrix XVI shows that "r" for the male group is .721 ±.020, while Matrix XXXVII shows the corresponding "r" for the female group to be .722 ±.020.

Sex differences:- There is no significant difference between these two correlation coefficients.

Matrix LVIII shows that "r" for the total group is .722 ±.014.

DESIRE FOR CHANGE

Matrix XX shows that "r" for the male group is .687 ±.022 and Matrix XLI shows that the corresponding "r" for the female group is .759 ±.018.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix LXII shows that "r" for the total group is .718 ±.015.

INDUSTRY

Matrix XV shows that "r" for the male group is .703 ±.022 and Matrix XXXVI shows the corresponding "r" for the female group to be .690 ±.022.

Sex Differences:- There is no significant differences between these two correlation coefficients.

Matrix LVII shows that "r" for the total group is .695 ±.016.

LEADERSHIP

Matrix IV shows that "r" for the male group is .691 ±.022 and Matrix XXV shows that the corresponding "r" for the female group is .669 ±.024.

Sex differences:- There is no significant difference between these two correlation coefficients.

Matrix XLVI shows that "r" for the total group is .687 ±.016.

CONSTRUCTIVENESS

Matrix V shows that "r" for the male group is .689 ±.022, while Matrix XXVI shows the corresponding "r" for the female group to be .655 ±.024.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix XLVII shows that "r" for the total group is .672 ±.016.

INITIATIVE

Matrix III shows that "r" for the male group is .684 ±.023 and Matrix XXIV shows the corresponding "r" for the female group to be .669 ±.024.

Sex Differences:- There is no significant difference between these two correlation coefficients.

Matrix XLV shows that "r" for the total group is .677 ±.016.

SELF - CONFIDENCE

Matrix IX shows that "r" for the male group is .679 ±.023 and Matrix XXX shows that the corresponding "r" for the female group is .721 ±.020.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix LI shows that "r" for the total group is .702 ±.016.

PERSISTENCE

Matrix XIII shows that "r" for the male group is .677 ±.023 and Matrix XXXIV shows the corresponding "r" for the female group to be .787 ±.016.

Sex differences:- There is a significant difference between these two correlation coefficients, the significance ratio being equal to 3.928. It is easier to assess girls for persistence, therefore, than boys.

Matrix LV shows that "r" for the total group is .730 ±.014.

AMBITION

Matrix II shows that "r" for the male group is .674 ±.023, while Matrix XXIII shows that the corresponding "r" for the female group is .609 ±.027.

Sex differences:- There is no significant difference between these two correlation coefficients.

Matrix XLIV shows that "r" for the total group is .642 ±.018.

CONTROL OF ATTENTION

Matrix XI shows that "r" for the male group is .648 ±.025, while Matrix XXXII shows the corresponding "r" for the female group to be .718 ±.020.

Sex differences:- There is no significant difference between these two coefficients of correlation.

Matrix LIII shows that "r" for the total group is .688 ±.016.

CAREFULNESS

Matrix VIII shows that "r" for the male group is .630 ±.026 and Matrix XXIX shows that the corresponding "r" for the female group is .696 ±.022.

<u>Sex differences</u>:- There is no significant difference between these two correlation coefficients.

Matrix L shows that "r" for the total group is .667 ±.017.

<u>RELIABILITY</u>

Matrix XIV shows that "r" for the male group is .627 ±.026, while Matrix XXXV shows the corresponding "r" for the female group to be .706 ±.021.

<u>Sex differences</u>:- There is no significant difference between these two correlation coefficients.

Matrix LVI shows that "r" for the total group is .662 ±.017.

<u>QUICKNESS</u>

Matrix VI shows that "r" for the male group is .624 ±.026 and Matrix XXVI shows that the corresponding "r" for the female group is .710 ±.021.

<u>Sex differences</u>:- There is no significant difference between these two coefficients of correlation.

Matrix XLVIII shows that "r" for the total group is .670 ±.016.

<u>CALMNESS UNDER PRESSURE</u>

Matrix X shows that "r" for the male group is .582 ±.028 and Matrix XXXI shows that the corresponding "r" for the female group is .594 ±.028.

<u>Sex differences</u>:- There is no significant difference between these two correlation coefficients.

Matrix LII shows that "r" for the total group is .587 ±.020.

<u>LINGUISTIC INTELLIGENCE v. TEMPERAMENT</u>

For the purpose of determining the degree of correlation which exists, in the present group of individuals, between temperament and linguistic intelligence, all the traits listed in the schedule have been given the numerical values of 5, 4, 3, 2, and 1 corresponding to a, b, c, d, and e. 'Temperament scores' for 1061 individuals (573 male and 488 female) have been obtained for the combined qualities. It should be noted that it was the teachers' estimates which were used in arriving at this 'temperament score'.

Male Group

The correlation coefficient between temperament and intelligence for the male group is .491 ±.021, as shown in Matrix LXIV.

Female Group

Matrix LXV shows that "r" (Temperament v Intelligence) for the female group is .499 ±.023.

Total Group

As shown in Matrix LXVI, the correlation coefficient between temperament and intelligence for the total group is .493 ±.015.

All three coefficients of correlation are significant and there is no significant difference between "r" (male group) and "r" (female group).

These coefficients of correlation are appreciably higher than was expected, but this is probably due to the fact that teachers' estimates of temperament are unduly biassed by educational attainments. It should also be pointed out that the individual traits do not seem to have been rated on a strictly five-point basis. In a five-point scale we assume that 10% of the total group are rated a for a particular trait, 20% are rated b, 40% are rated c, 20% are rated d, and 10% are rated e. It would seem, however, that, in both teachers' and parents' estimates, there are far too many individuals rated c and far too few rated a and e. This criticism is especially true of the teachers' estimates. The distribution of 'temperament scores' and the distributions of individual trait ratings are, therefore, much more leptokurtic than they should be.

The fifteen-point scale used in the classification of 'temperament scores' is explained below.

Temperament Score	Rating
96 -	A+
91 - 95...........	A
86 - 90...........	A-
81 - 85...........	B+
76 - 80...........	B
71 - 75...........	B-
66 - 70...........	C+
61 - 65...........	C
56 - 60...........	C-
51 - 55...........	D+
46 - 50...........	D
41 - 45...........	D-
36 - 40...........	E+
31 - 35...........	E
- 30...........	E-

TABLE SHOWING CORRELATION BETWEEN TEACHERS' ESTIMATES AND PARENTS' ESTIMATES FOR DIFFERENT TEMPERAMENT TRAITS

(Male Group)

Table I

Trait	Coefficient of Correlation	Probable Error
Tenderness...............	·884	·009
General emotionality......	·815	·014
Sociability..............	·789	·016
Fearlessness.............	·788	·016
Alertness................	·739	·019
Assertiveness............	·722	·020
Energy...................	·722	·020
Co-operativeness.........	·721	·020
Industry.................	·703	·022
Leadership...............	·691	·022
Constructiveness.........	·689	·022
Desire for change........	·687	·022
Initiative...............	·684	·023
Self-confidence..........	·679	·023
Persistence..............	·677	·023
Ambition.................	·674	·023
Control of attention......	·648	·025
Carefulness..............	·630	·026
Reliability..............	·627	·026
Quickness................	·624	·026
Calmness under pressure...	·582	·028

Average correlation = ·704

Average probable error = ±·021

Matrix I

Parents' Estimate

	E	D	C	B	A	F
A			2	7	10	19
B			17	34	6	57
C		13	94	15	2	124
D	3	24	21			48
E	1	1				2
F	4	38	134	56	18	250

Assertiveness

r = .722

P.E.= ±.020

Matrix II

Parents' Estimate

	E	D	C	B	A	F
A			2	6	9	17
B		1	10	29	12	52
C	2	19	87	22	4	134
D	4	23	10	3		40
E	1	6				7
F	7	49	109	60	25	250

Ambition

r = .674

P.E.= ±.023

Matrix III

Parents' Estimate

	E	D	C	B	A	F
A			2	6	10	18
B		2	13	23	12	50
C		15	89	22		126
D	4	27	9	7		47
E	3	5	1			9
F	7	49	114	58	22	250

Initiative

r = .684

P.E.= ±.023

Matrix IV

Parents' Estimate

	E	D	C	B	A	F
A			3	4	10	17
B		1	12	28	16	57
C		18	73	19	4	114
D	2	29	19	4		54
E	5	2	1			8
F	7	50	108	55	30	250

Leadership

r = .691

P.E. = ±.022

Matrix V

Parents' Estimate

	E	D	C	B	A	F
A			2	5	8	15
B		1	14	27	9	51
C	1	14	90	24	2	131
D	1	21	18	1	1	42
E	6	5				11
F	8	41	124	57	20	250

Constructiveness

r = .689

P.E. = ±.022

Matrix VI

Parents' Estimate

	E	D	C	B	A	F
A			3	4	7	14
B			19	20	9	48
C		23	86	25	6	140
D	4	19	10	4		37
E	4	7				11
F	8	49	118	53	22	250

Quickness

r = .624

P.E. = ±.026

Matrix VII

Parents' Estimate

	E	D	C	B	A	F
A			1	5	10	16
B			15	27	13	55
C		16	89	22	6	133
D	3	22	10			35
E	5	6				11
F	8	44	115	54	29	250

Alertness

r = .739

P.E. = ±.019

Matrix VIII

Parents' Estimate

	E	D	C	B	A	F
A			2	9	7	18
B		4	20	19	16	59
C		10	88	17	6	121
D	3	17	13	5		38
E	8	5	1			14
F	11	36	124	50	29	250

Carefulness

r = .630

P.E. = ±.026

Matrix IX

Parents' Estimate

	E	D	C	B	A	F
A			1	7	11	19
B			24	31	8	63
C		14	80	22	4	120
D		20	20	2		42
E	4	2				6
F	4	36	125	62	23	250

Self-confidence

r = .679

P.E. = ±.023

Matrix X

Parents' Estimate

	E	D	C	B	A	F
A			2	4	5	11
B		2	24	22	5	53
C		9	99	24	3	135
D	1	27	13	4		45
E	2	2	2			6
F	3	40	140	54	13	250

Calmness under pressure

r = .582

P.E. = ±.028

Matrix XI

Parents' Estimate

	E	D	C	B	A	F
A			1	4	8	13
B			20	24	4	48
C		18	96	24	2	140
D	1	22	15	4		42
E	4	2	1			7
F	5	42	133	56	14	250

Control of attention

r = .648

P.E. = ±.025

Matrix XII

Parents' Estimate

	E	D	C	B	A	F
A			1	3	8	12
B			17	30	7	54
C		13	91	25	1	130
D	2	30	11	1		44
E	2	6	2			10
F	4	49	122	59	16	250

Energy

r = .722

P.E. = ±.020

Parents' Estimate

Matrix XIII

	E	D	C	B	A	F
A			1	4	8	13
B		1	20	23	6	50
C		15	94	27	1	137
D	1	19	21	1		42
E	4	4				8
F	5	39	136	55	15	250

Persistence

r = .677

P.E. = ±.023

Parents' Estimate

Matrix XIV

	E	D	C	B	A	F
A			1	5	11	17
B		1	20	25	7	53
C		4	75	37	4	120
D		18	29	1	1	49
E	1	6	4			11
F	1	29	129	68	23	250

Reliability

r = .627

P.E. = ±.026

Parents' Estimate

Matrix XV

	E	D	C	B	A	F
A			2	2	6	10
B		1	16	33	6	56
C		4	100	29	2	135
D	2	25	12	1		40
E	3	5	1			9
F	5	35	131	65	14	250

Industry

r = .703

P.E. = ±.022

Matrix XVI

Parents' Estimate

	E	D	C	B	A	F
A			1	7	12	20
B			16	35	9	60
C		17	80	18	5	120
D	4	19	14	2		39
E	5	5	1			11
F	9	41	112	62	26	250

Co-operativeness

r = .721

P.E. = ±.020

Matrix XVII

Parents' Estimate

	E	D	C	B	A	F
A			1	5	15	21
B			22	29	10	61
C		3	86	28	1	118
D	2	29	11			42
E	6	2				8
F	8	34	120	62	26	250

Sociability

r = .789

P.E. = ±.016

Matrix XVIII

Parents' Estimate

	E	D	C	B	A	F
A				2	9	11
B			10	22		32
C		10	143	6		159
D	4	28	4			36
E	10	2				12
F	14	40	157	30	9	250

Tenderness

r = .884

P.E. = ±.009

Matrix XIX

Parents' Estimate

	E	D	C	B	A	F
A			1	2	11	14
B			12	20	8	40
C		11	127	20		158
D	1	17	10			28
E	6	4				10
F	7	32	150	42	19	250

Fearlessness

r = .788

P.E. = ±.016

Matrix XX

Parents' Estimate

	E	D	C	B	A	F
A				2	4	6
B			22	22	4	48
C		22	100	27		149
D	5	20	15			40
E	6	1				7
F	11	43	137	51	8	250

Desire for change

r = .687

P.E. = ±.022

Matrix XXI

Parents' Estimate

	E	D	C	B	A	F
A				2	8	10
B			14	30	4	48
C		16	112	20		148
D		31	4			35
E	7	2				9
F	7	49	130	52	12	250

General Emotionality

r = .815

P.E. = ±.014

TABLE SHOWING CORRELATION BETWEEN TEACHERS' ESTIMATES AND PARENTS' ESTIMATES FOR DIFFERENT TEMPERAMENT TRAITS

(Female Group)

Table II

Trait	Coefficient of Correlation	Probable Error
Tenderness................	.834	.013
Fearlessness..............	.802	.015
General emotionality.......	.800	.015
Persistence...............	.787	.016
Sociability...............	.772	.017
Desire for change.........	.759	.018
Assertiveness.............	.747	.019
Energy....................	.738	.019
Co-operativeness..........	.722	.020
Alertness.................	.722	.020
Self-confidence...........	.721	.020
Control of attention......	.718	.020
Quickness.................	.710	.021
Reliability...............	.706	.021
Carefulness...............	.696	.022
Industry..................	.690	.022
Initiative................	.669	.024
Leadership................	.669	.024
Constructiveness..........	.655	.024
Ambition..................	.609	.027
Calmness under pressure....	.594	.028

Average correlation = .720

Average probable error = $\pm$.020

Matrix XXII

Parents' Estimate

	E	D	C	B	A	F
A			1	4	6	11
B			13	33	7	53
C		11	92	14	1	118
D	7	31	21			59
E	5	3	1			9
F	12	45	128	51	14	250

Assertiveness

r = .747

P.E. = ±.019

Matrix XXIII

Parents' Estimate

	E	D	C	B	A	F
A			2	5	5	12
B		2	17	26	9	54
C		16	81	27	3	127
D	4	20	18	2		44
E	4	5	3	1		13
F	8	43	121	61	17	250

Ambition

r = .609

P.E. =- ±.027

Matrix XXIV

Parents' Estimate

	E	D	C	B	A	F
A				6	8	14
B		1	20	30	7	58
C		17	74	26	4	121
D	2	25	20	2		49
E	4	3	1			8
F	6	46	115	64	19	250

Initiative

r = .669

P.E. = ±.024

Matrix XXV

Parents' Estimate

	E	D	C	B	A	F
A				4	6	10
B	.	1	21	29	3	54
C		11	87	25	3	126
D	4	32	19	3		58
E	4	5	3			12
F	8	49	130	61	12	250

Leadership

r = .669

P.E. = ±.024

Matrix XXVI

Parents' Estimate

	E	D	C	B	A	F
A				5	7	12
B			20	30	8	58
C		21	86	24	5	136
D	1	17	13	1	1	33
E	5	5	1			11
F	6	43	120	60	21	250

Constructiveness

r = .655

P.E. = ±.024

Matrix XXVII

Parents' Estimate

	E	D	C	B	A	F
A			1	5	10	16
B			19	27	8	54
C		11	83	30	2	126
D	2	25	14	2		43
E	5	4	2			11
F	7	40	119	64	20	250

Quickness

r = .710

P.E. = ±.021

Matrix XXVIII

Parents' Estimate

	E	D	C	B	A	F
A			1	4	9	14
B			16	32	8	56
C		12	85	25	2	124
D	3	24	16	1		44
E	5	4	3			12
F	8	40	121	62	19	250

Alertness

r = .722

P.E. = ±.020

Matrix XXIX

Parents' Estimate

	E	D	C	B	A	F
A				6	8	14
B		2	23	27	7	59
C		13	69	23	4	109
D	4	33	18	1		56
E	7	2	3			12
F	11	50	113	57	19	250

Carefulness

r = .696

P.E. = ±.022

Matrix XXX

Parents' Estimate

	E	D	C	B	A	F
A			1	5	10	16
B			15	25	8	48
C		16	86	23	4	129
D	2	23	20	2		47
E	8	2				10
F	10	41	122	55	22	250

Self-confidence

r = .721

P.E. = ±.020

Matrix XXXI

Parents' Estimate

	E	D	C	B	A	F
A			1	4	5	10
B			24	21	5	50
C		20	80	32	6	138
D	1	20	20	2		43
E	6	2	1			9
F	7	42	126	59	16	250

Calmness under pressure

r = .594

P.E. = ±.028

Matrix XXXII

Parents' Estimate

	E	D	C	B	A	F
A			1	3	10	14
B			15	24	5	44
C		11	94	29	2	136
D	3	28	13	2		46
E	6	2	2			10
F	9	41	125	58	17	250

Control of attention

r = .718

P.E. = ±.020

Matrix XXXIII

Parents' Estimate

	E	D	C	B	A	F
A			2	5	8	15
B			14	36	7	57
C		10	90	17	5	122
D	2	31	10	2		45
E	7	2	2			11
F	9	43	118	60	20	250

Energy

r = .738

P.E. = ±.019

Matrix XXXIV

Parents' Estimate

	E	D	C	B	A	F
A				2	9	11
B			13	28	4	45
C		18	102	20		140
D	1	30	16			47
E	7					7
F	8	48	131	50	13	250

Persistence

r = .787

P.E. = ±.016

Matrix XXXV

Parents' Estimate

	E	D	C	B	A	F
A			1	5	10	16
B			20	34	6	60
C		11	87	19	4	121
D	1	28	10	5		44
E	5	3	1			9
F	6	42	119	63	20	250

Reliability

r = .706

P.E. = ±.021

Matrix XXXVI

Parents' Estimate

	E	D	C	B	A	F
A			1	4	7	12
B			14	34	7	55
C		13	96	26	3	138
D	3	21	10	4		38
E	5	1	1			7
F	8	35	122	68	17	250

Industry

r = .690

P.E. = ±.022

Matrix XXXVII

Parents' Estimate

	E	D	C	B	A	F
A			1	6	8	15
B			12	32	10	54
C		12	95	22	3	132
D	1	22	14	3		40
E	5	4				9
F	6	38	122	63	21	250

Co-operativeness

r = .722

P.E. = ±.020

Matrix XXXVIII

Parents' Estimate

	E	D	C	B	A	F
A				7	10	17
B			14	40	9	63
C		8	89	18	5	120
D		30	14			44
E	4	2				6
F	4	40	117	65	24	250

Sociability

r = .772

P.E. = ±.017

Matrix XXXIX

Parents' Estimate

	E	D	C	B	A	F
A				7	9	16
B			17	34	8	59
C		6	110	10		126
D		29	11			40
E	6	3				9
F	6	38	138	51	17	250

Tenderness

r = .834

P.E. = ±.013

Matrix XL

Parents' Estimate

	E	D	C	B	A	F
A				2	6	8
B			11	29	5	45
C		17	107	19		143
D	3	29	12			44
E	9	1				10
F	12	47	130	50	11	250

Fearlessness

r = .802

P.E. = ±.015

Matrix XLI

Parents' Estimate

	E	D	C	B	A	F
A				2	8	10
B			8	14	8	30
C		2	116	33	1	152
D	1	28	15			44
E	8	5	1			14
F	9	35	140	49	17	250

Desire for change

r = .759

P.E. = ±.018

Matrix XLII

Parents' Estimate

	E	D	C	B	A	F
A				4	9	13
B			14	35	7	56
C		10	89	22	2	123
D	1	31	14			46
E	8	4				12
F	9	45	117	61	18	250

General emotionality

r = .800

P.E. = ±.015

TABLE SHOWING CORRELATION BETWEEN TEACHERS' ESTIMATES AND PARENTS' ESTIMATES FOR DIFFERENT TEMPERAMENT TRAITS

(Total Group - Male and Female)

Table III

Trait	Coefficient of Correlation	Probable Error
Tenderness...............	.860	.008
General emotionality......	.806	.011
Fearlessness..............	.796	.011
Sociability...............	.781	.012
Assertiveness.............	.738	.014
Persistence...............	.730	.014
Energy....................	.730	.014
Alertness.................	.730	.014
Co-operativeness..........	.722	.014
Desire for change.........	.718	.015
Self-confidence...........	.702	.016
Industry..................	.695	.016
Control of attention......	.688	.016
Leadership................	.687	.016
Initiative................	.677	.016
Constructiveness..........	.672	.016
Quickness.................	.670	.016
Carefulness...............	.667	.017
Reliability...............	.662	.017
Ambition..................	.642	.018
Calmness under pressure...	.587	.020

Average correlation = .712

Average probable error = $\pm$.015

Matrix XLIII

Parents' Estimate

	E	D	C	B	A	F
A			3	11	16	30
B			30	67	13	110
C		24	186	29	3	242
D	10	55	42			107
E	6	4	1			11
F	16	83	262	107	32	500

Assertiveness

r = .738

P.E. = ±.014

Matrix XLIV

Parents' Estimate

	E	D	C	B	A	F
A			4	11	14	29
B		3	27	55	21	106
C	2	35	168	49	7	261
D	8	43	28	5		84
E	5	11	3	1		20
F	15	92	230	121	42	500

Ambition

r = .642

P.E. = ±.018

Matrix XLV

Parents' Estimate

	E	D	C	B	A	F
A			2	12	18	32
B		3	33	53	19	108
C		32	163	48	4	247
D	6	52	29	9		96
E	7	8	2			17
F	13	95	229	122	41	500

Initiative

r = .677

P.E. = ±.016

Matrix XLVI — Leadership

Parents' Estimate

	E	D	C	B	A	F
A			3	8	16	27
B		2	33	57	19	111
C		29	150	44	7	230
D	6	61	38	7		112
E	9	7	4			20
F	15	99	228	116	42	500

$r = .687$

P.E. = $\pm .016$

Matrix XLVII — Constructiveness

Parents' Estimate

	E	D	C	B	A	F
A			2	10	15	27
B		1	34	57	17	109
C	1	35	176	48	7	267
D	2	38	31	2	2	75
E	11	10	1			22
F	14	84	244	117	41	500

Matrix XLVIII — Quickness

Parents' Estimate

	E	D	C	B	A	F
A			4	9	17	30
B			38	47	17	102
C		34	169	55	8	266
D	6	44	24	6		80
E	9	11	2			22
F	15	89	237	117	42	500

$r = .670$

P.E. = $\pm .017$

Matrix XLIX

Parents' Estimate

	E	D	C	B	A	F
A			2	9	19	30
B			31	59	21	111
C		28	174	47	8	257
D	6	46	26	1		79
E	10	10	3			23
F	16	84	236	116	48	500

Alertness

r = .730

P.E. = ±.014

Matrix L

Parents' Estimate

	E	D	C	B	A	F
A			2	15	15	32
B		6	43	46	23	118
C		23	157	40	10	230
D	7	50	31	6		94
E	15	7	4			26
F	22	86	237	107	48	500

Carefulness

r = .667

P.E. = ±.017

Matrix LI

Parents' Estimate

	E	D	C	B	A	F
A			2	12	21	35
B			39	56	16	111
C		30	166	45	8	249
D	2	43	40	4		89
E	12	4				16
F	14	77	247	117	45	500

Self-confidence

r = .702

P.E. = ±.016

Matrix LII

Parents' Estimate

	E	D	C	B	A	F
A			3	8	10	21
B		2	48	43	10	103
C		29	179	56	9	273
D	2	47	33	6		88
E	8	4	3			15
F	10	82	266	113	29	500

Calmness under pressure

r = .587

P.E. = ±.020

Matrix LIII

Parents' Estimate

	E	D	C	B	A	F
A			2	7	18	27
B			35	48	9	92
C		29	190	53	4	276
D	4	50	28	6		88
E	10	4	3			17
F	14	83	258	114	31	500

Control of attention

r = .688

P.E. = ±.016

Matrix LIV

Parents' Estimate

	E	D	C	B	A	F
A			3	8	16	27
B			31	66	14	111
C		23	181	42	6	252
D	4	61	21	3		99
E	9	8	4			21
F	13	92	240	119	36	500

Energy

r = .730

P.E. = ±.014

Matrix LV — Persistence

Parents' Estimate

	E	D	C	B	A	F
A			1	6	17	24
B		1	33	51	10	95
C		33	196	47	1	277
D	2	49	37	1		89
E	11	4				15
F	13	87	267	105	28	500

Matrix LVI — Reliability

$r = .662$

$P.E. = \pm .017$

Parents' Estimate

	E	D	C	B	A	F
A			2	10	21	33
B		1	40	59	13	113
C		15	162	56	8	241
D	1	46	39	6	1	93
E	6	9	5			20
F	7	71	248	131	43	500

Matrix LVII — Industry

$r = .695$

$P.E. = \pm .016$

Parents' Estimate

	E	D	C	B	A	F
A			3	16	13	22
B		1	30	67	13	111
C		17	196	55	5	273
D	5	46	22	5		78
E	8	6	2			16
F	13	70	253	133	31	500

Matrix LVIII

Parents' Estimate

	E	D	C	B	A	F
A			2	13	20	35
B			28	67	19	114
C		29	175	40	8	252
D	5	41	28	5		79
E	10	9	1			20
F	15	79	234	125	47	500

Co-operativeness

r = .722

P.E.= ±.014

Matrix LIX

Parents' Estimate

	E	D	C	B	A	F
A			1	12	25	38
B			36	69	19	124
C		11	175	46	6	238
D	2	59	25			86
E	10	4				14
F	12	74	237	127	50	500

Sociability

r = .781

P.E.= ±.012

Matrix LX

Parents' Estimate

	E	D	C	B	A	F
A				9	18	27
B			27	56	8	91
C		16	253	16		285
D	4	57	15			76
E	16	5				21
F	20	78	295	81	26	500

Tenderness

r = .860

P.E. = ±.008

Matrix LXI

Parents' Estimate

	E	D	C	B	A	F
A		.	1	4	17	22
B			23	49	13	85
C		28	234	39		301
D	4	46	22			72
E	15	5				20
F	19	79	280	92	30	500

Fearlessness

r = .796

P.E. = ±.011

Matrix LXII

Parents' Estimate

	E	D	C	B	A	F
A				4	12	16
B				30	36	78
C		24	216	60	1	301
D	6	48	30			84
E	14	6	1			21
F	20	78	277	100	25	500

Desire for change

r = .718

P.E. = ±.015

Matrix LXIII

Parents' Estimate

	E	D	C	B	A	F
A				6	17	23
B			28	65	11	104
C		26	201	42	2	271
D	1	62	18			81
E	15	6				21
F	16	94	247	113	30	500

General emotionality

r = .806

P.E. = ±.011

MATRIX SHOWING CORRELATION BETWEEN INTELLIGENCE AND TEMPERAMENT

(Male)

Matrix LXIV

Temperament

Intelligence	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+									1	1	1		2		1	6
A										1		1				2
A-							1		2		2		2	2	1	10
B+								4		1		3		1		9
B						3	3	10	6	6	4	4	1	1		38
B-				1	1	1	4	20	12	6	6	3	2	1		57
C+		1	1	2	2	4	9	26	22	15	2	4	4	1	2	95
C		2	2		6	9	9	34	15	13	7	5	6			108
C-	1	2	2	3	4	10	13	22	18	11	4	1	1			92
D+		2	1	9	9	11	10	22	12	1	3	1	1			82
D			3	8	8	6	6	8	2	1	1					43
D-		2		4	4	6	3	2	2	1						24
E+	1		1		1			1		1						5
E				1			1									2
E-																-
F	2	9	10	28	35	50	59	149	92	58	30	22	19	6	4	573

Coefficient of correlation = .491

Probable error (r) = ±.021

MATRIX SHOWING CORRELATION BETWEEN INTELLIGENCE AND TEMPERAMENT

(Female)

Matrix LXV

Temperament

Intelligence	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+											1					1
A											2	1				3
A-											1	1		1		3
B+					1	1	1	3	2	5		2	2	1		18
B					1	1	3	10	8	4	2	4	1	1		35
B-				1		3	3	23	8	8	4	3	5			58
C+				1	4	6	4	20	12	11	6	4	6	1		75
C		1	1	2	2	6	12	23	14	14	6	5	2			88
C-		1	1	5	9	12	17	25	14	7	3		1			95
D+		1		8	7	9	8	17	10	1	1					62
D	1	1	3	4	4	4	2	7	7	2	1					36
D-		2	2	2	2	1	1	1								11
E+	1	1		1												3
E																-
E-																-
F	2	7	7	24	30	43	51	129	75	52	27	20	17	4	-	488

Coefficient of correlation = .499

Probable error (r) = ±.023

MATRIX SHOWING CORRELATION BETWEEN INTELLIGENCE AND TEMPERAMENT

(Male and Female)

Matrix LXVI

Temperament

Intelligence	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+									1	1	2		2		1	7
A										1	2	2				5
A-							1		2		3	1	2	3	1	13
B+					1	1	1	7	2	6		5	2	2		27
B					1	4	6	20	14	10	6	8	2	2		73
B-				2	1	4	7	43	20	14	10	6	7	1		115
C+		1	1	3	6	10	13	46	34	26	8	8	10	2	2	170
C		3	3	2	8	15	21	57	29	27	13	10	8			196
C-	1	3	3	8	13	22	30	47	32	18	7	1	2			187
D+		3	1	17	16	20	18	39	22	2	4	1	1			144
D	1	1	6	12	12	10	8	15	9	3	2					79
D-		4	2	6	6	7	4	3	2	1						35
E+	2	1	1	1	1			1		1						8
E				1			1									2
E-																-
F	4	16	17	52	65	93	110	278	167	110	57	42	36	10	4	1061

Coefficient of correlation = .493

Probable error (r) = ±.015

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Chapter 8

STATISTICAL ANALYSIS OF TEST DATA

(A) Frequency Distributions

It has to be pointed out at the commencement of this chapter that, in the statistical analysis of data, the writer is only concerned with the frequency distributions of the total scores in the various tests, which compose the vocational guidance test battery, and that he does not concern himself, for the present, with the scores in individual sub-tests. The more rigid analysis of the individual sub-test distributions will probably be attempted at some later date.

MENTAL AGE

Male Group

Table I shows the distribution of mental ages for the various school groups and for the total male group, while the histographic representation of the frequency distribution for the total male group appears on the following page. As shown in Table II, the mean mental age for the total male group is 174.928 months with a probable error of ±.416 months. The standard deviation for the group is 18.516 months. The measure of skewness for this distribution has a value of -.001.

DISTRIBUTION OF MENTAL AGES

(Male)

M.A. months	School T	B	J.C.	D.K.	Total
246 -	-	-	1	-	1
240 - 245	1	-	1	-	2
234 - 239	-	3	1	1	5
228 - 233	1	-	3	-	4
222 - 227	2	1	-	-	3
216 - 221	2	-	2	1	5
210 - 215	4	1	1	1	7
204 - 209	8	2	6	1	17
198 - 203	21	14	7	4	46
192 - 197	26	11	12	5	54
186 - 191	34	24	28	4	90
180 - 185	43	27	31	12	113
174 - 179	51	39	33	11	134
168 - 173	37	34	28	16	115
162 - 167	36	34	14	16	100
156 - 161	25	19	22	17	83
150 - 155	15	16	8	10	49
144 - 149	15	8	5	13	41
138 - 143	4	4	1	13	22
132 - 137	2	-	-	5	7
126 - 131	2	-	-	-	2
120 - 125	-	-	-	1	1
- 119	1	-	-	1	2
	330	237	204	132	903

HISTOGRAM OF DATA CONTAINED IN TABLE

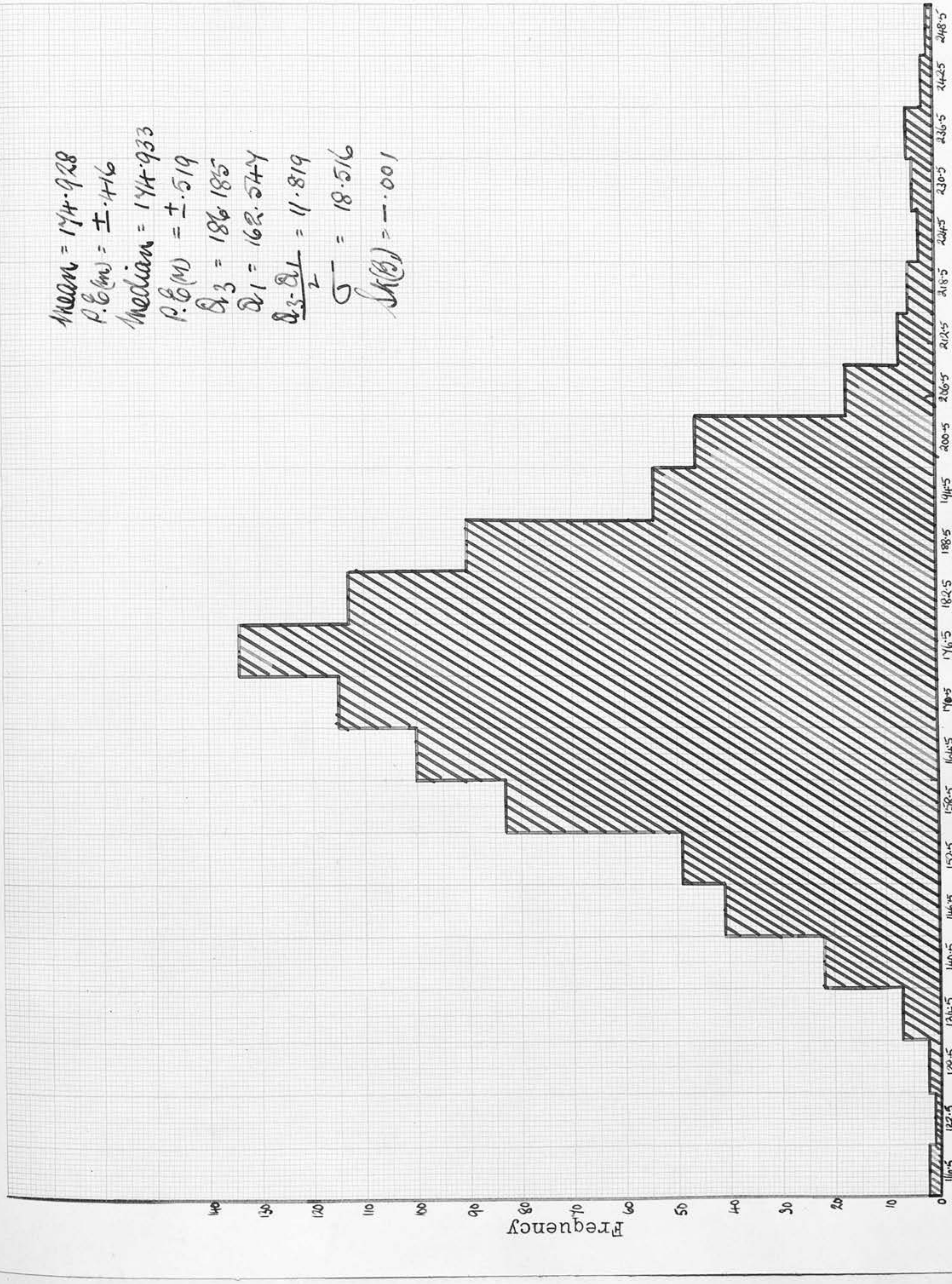


Table II also shows various parameters for this distribution of mental ages. It should be noted that for all practical purposes the distribution is symmetrical about the mean.

Table II

Mean..........................	174.928
Probable error (mean)..........	$\pm$.416
Median........................	174.933
Probable error (median)........	$\pm$.519
Upper quartile (Q_3)...........	186.185
Lower quartile (Q_1)...........	162.547
Semi-interquartile range.......	11.819
Standard deviation.............	18.516
Skewness (β_1).................	-.001

Female Group

Table III shows the distribution of mental ages for the total female group and for the various school groups, the histographic representation of the frequency distribution appearing on the following page. Table IV shows that the mean mental age for the total female group is 174.736 months with a probable error of $\pm$.377 months. The standard deviation for the group is 16.032 months and the measureof skewnesshas a value of +.127; other parameters pertaining to this distribution appear in Table IV.

Sex differences

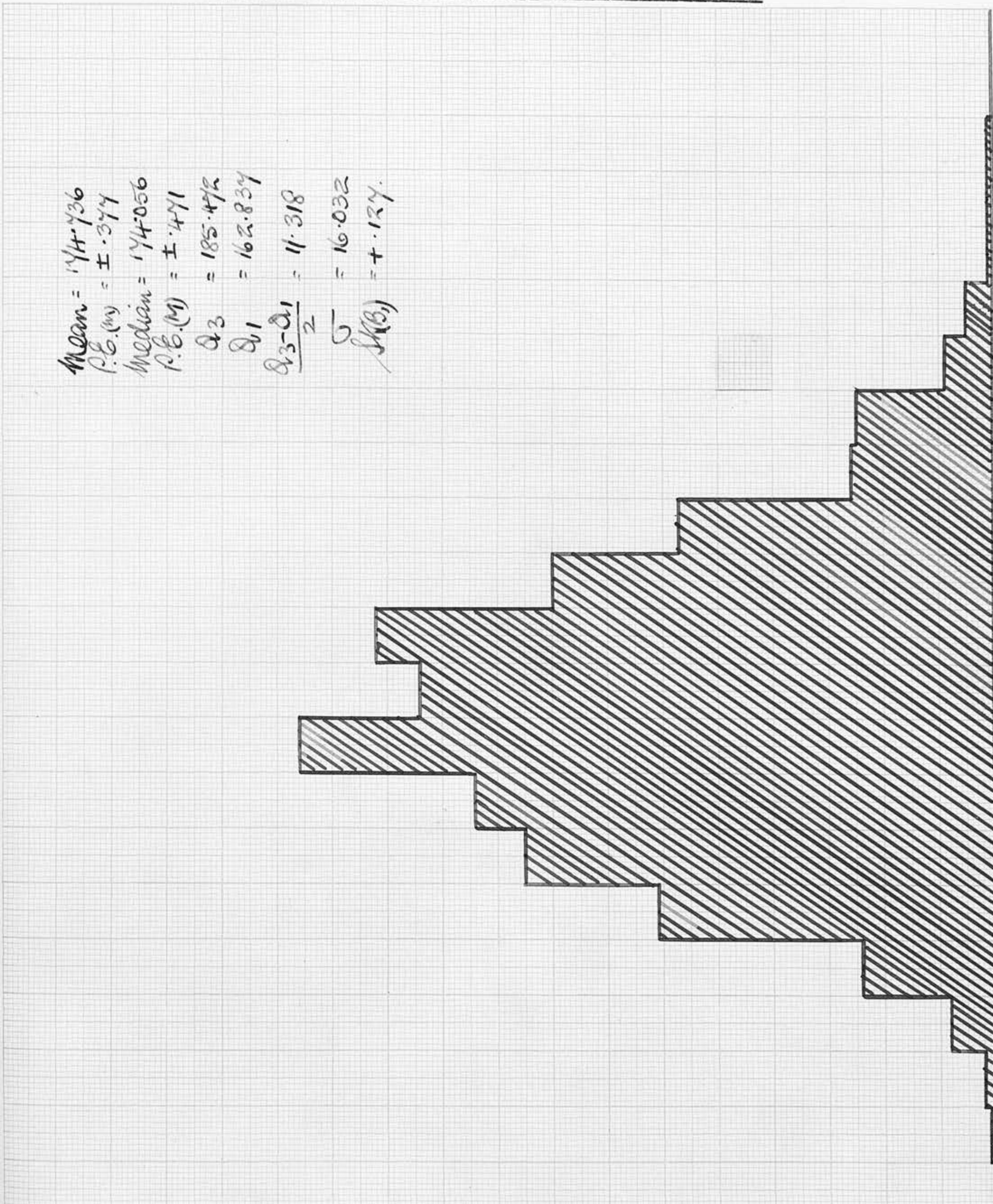
There is no significant difference between the mean mental ages

DISTRIBUTION OF MENTAL AGES

(Female)

M.A. months	School T	B	J.C.	D.K.	Total
246 -	-	-	-	-	-
240 - 245	-	-	-	-	-
234 - 239	1	-	-	-	1
228 - 233	-	-	1	-	1
222 - 227	-	-	1	-	1
216 - 221	3	1	1	-	5
210 - 215	4	1	3	1	9
204 - 209	7	7	10	1	25
198 - 203	9	5	9	3	26
192 - 197	24	14	12	7	57
186 - 191	35	28	12	5	80
180 - 185	39	33	32	8	112
174 - 179	47	27	24	6	104
168 - 173	50	33	25	18	126
162 - 167	36	23	22	13	94
156 - 161	42	22	13	8	85
150 - 155	23	11	15	12	61
144 - 149	10	7	3	4	24
138 - 143	3	-	2	3	8
132 - 137	1	-	-	1	2
126 - 131	-	-	1	-	1
120 - 125	-	-	-	-	-
- 119	-	-	-	-	-
	334	212	186	90	822

HISTOGRAM OF DATA CONTAINED IN TABLE



of the male and female groups.

Table IV

Mean...........................	174.736
Probable error (mean).........	±.377
Median.........................	174.056
Probable error (median).......	±.471
Upper quartile (Q_3)...........	185.472
Lower quartile (Q_1)...........	162.837
Semi-interquartile range......	11.318
Standard deviation............	16.032
Skewness (β_1).................	+.127

Total Group - Male and Female

Table V shows the mean mental age for the total group and for the various school groups which compose it. The histographic representation of the frequency distribution appears on the following page. Table VI shows that the mean mental age for the total group is 174.844 months with a probable error of ±.282 months. The median mental age is 174.524 months with a probable error of ±.352 months, while the standard deviation for the group is 17.364 months. The measure of skewness for this distribution is +.055, i.e. very slightly positive, this is however not statistically significant.

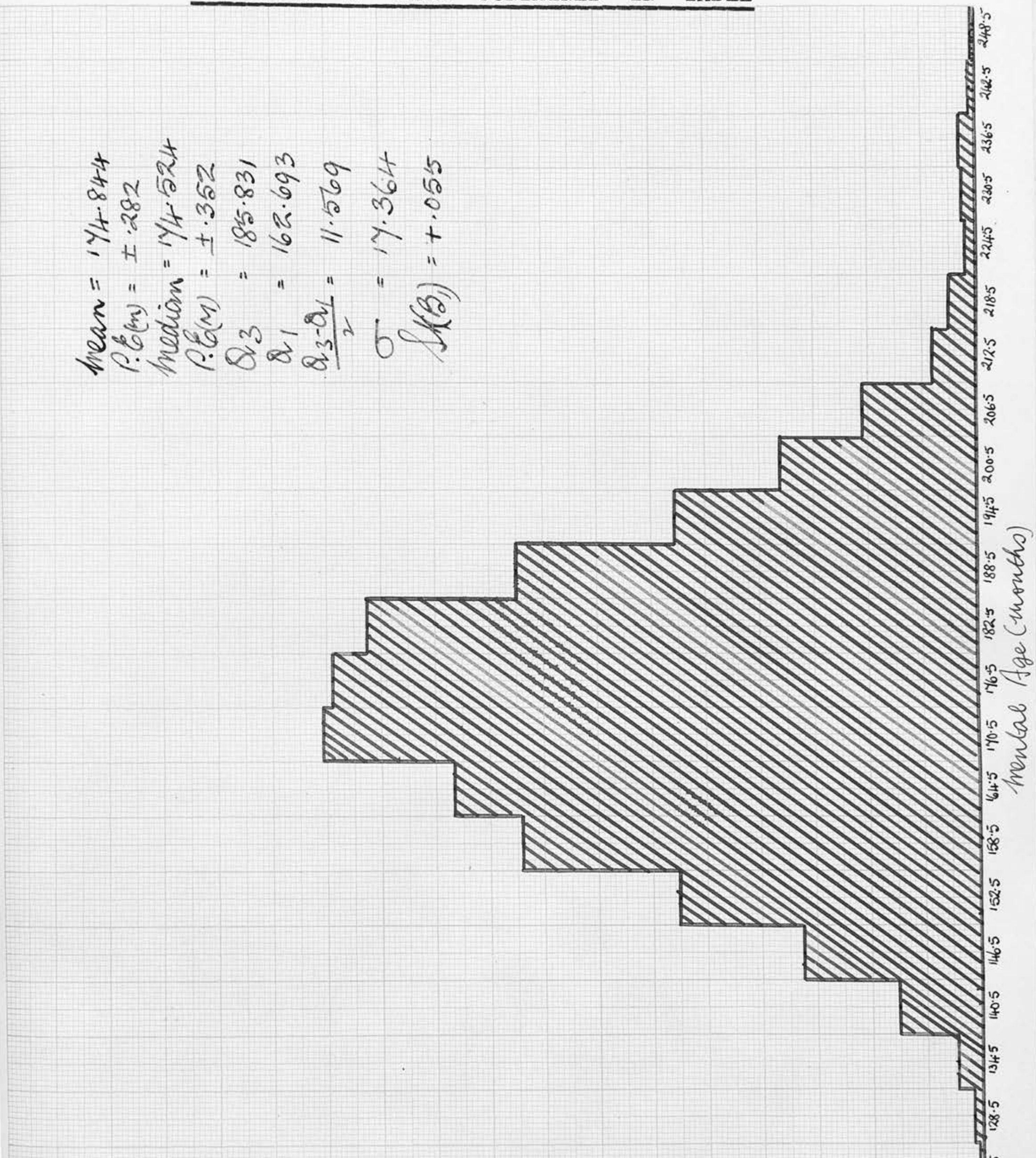
The mean chronological age for the total group was, as has been previously noted, 166.369 months. There is therefore a difference of 8.475 months between the mean mental age and the mean chronological

DISTRIBUTION OF MENTAL AGES

(Male and Female)

M.A. months	School				Total
	T	B	J.C.	D.K.	
246 -	-	-	1	-	1
240 - 245	1	-	1	-	2
234 - 239	1	3	1	1	6
228 - 233	1	-	4	-	5
222 - 227	2	1	1	-	4
216 - 221	5	1	3	1	10
210 - 215	8	2	4	2	16
204 - 209	15	9	16	2	42
198 - 203	30	19	16	7	72
192 - 197	50	25	24	12	111
186 - 191	69	52	40	9	170
180 - 185	82	60	63	20	225
174 - 179	98	66	57	17	238
168 - 173	87	67	53	34	241
162 - 167	72	57	36	29	194
156 - 161	67	41	35	25	168
150 - 155	38	27	23	22	110
144 - 149	25	15	8	17	65
138 - 143	7	4	3	16	30
132 - 137	3	-	-	6	9
126 - 131	2	-	1	-	3
120 - 125	-	-	-	1	1
- 119	1	-	-	1	2
	664	449	390	220	1725

HISTOGRAM OF DATA CONTAINED IN TABLE



for the total group tested in the investigation, indicating that the group as a whole is approximately eight months in advance of its chronological age. This finding should, however, be regarded with some reserve, since it is the general belief that the American norms used for the Kuhlmann-Anderson are not suitable for Scottish children.

Table VI

Mean..............................	174.844
Probable error (mean)..............	$\pm$.282
Median............................	174.524
Probable error (median)............	$\pm$.352
Upper quartile (Q_3)................	185.831
Lower quartile (Q_1)................	162.693
Semi-interquartile range...........	11.569
Standard deviation.................	17.364
Skewness (β_1)......................	$\pm$.055

The discrepancy between the mental and chronological ages accounts for the rather high mean intelligence quotient which has been found for the group. In the preparation of ratings for the test we have, as will be later seen, taken the range 103 - 107 as representing C the middle rating in the 15-point scale.

LINGUISTIC INTELLIGENCE

Male Group

Table VII shows the frequency distributions of linguistic intelligence quotients for the various school groups and for the total male group (903 individuals), while the histographic representation of the frequency distribution for the total group appears below on the same page. Table VIII shows that the mean intelligence quotient for this group is 105.140 with a probable error of ±.247 and that the median for the distribution has a value of 104.850 with a probable error of ±.308. The standard deviation for the group is 10.965 and the measure of skewness is very small, having a value of +.079. The other parameters pertaining to the distribution are shown in Table VIII

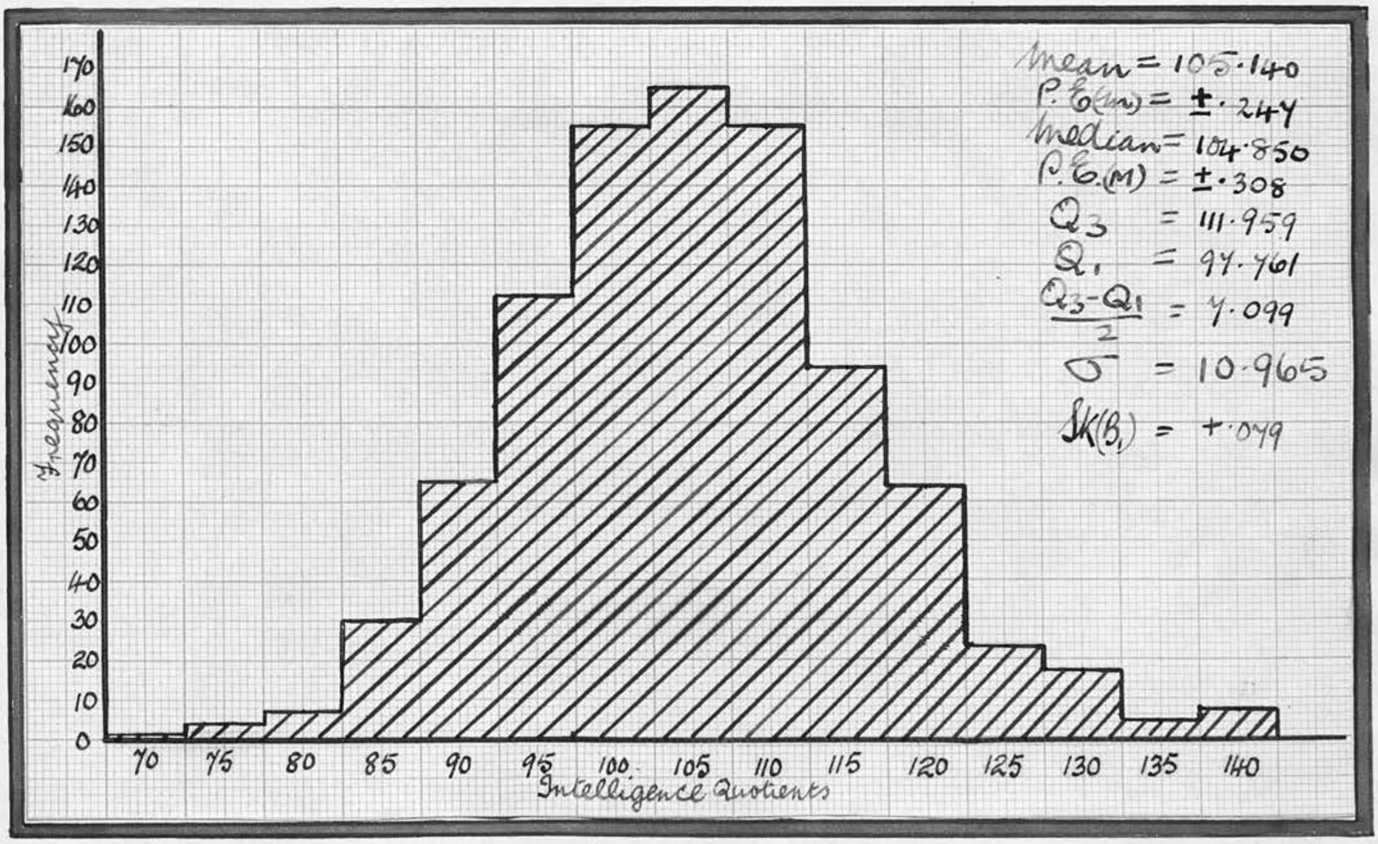
Table VIII

Mean	105.140
Probable error (mean)	±.247
Median	104.850
Probable error (median)	±.308
Upper quartile (Q_3)	111.959
Lower quartile (Q_1)	97.761
Semi-interquartile range	7.099
Standard deviation	10.965
Skewness (β_1)	+.079

Note:- The above parameters refer only to the frequency distribution of the linguistic intelligence quotients (total male group).

DISTRIBUTION OF INTELLIGENCE QUOTIENTS
(Male)

I.Q.	School				Total
	T	B	J.C.	D.K.	
138 -	1	2	4	-	7
133 - 137	2	1	-	1	4
128 - 132	7	3	6	1	17
123 - 127	14	3	6	-	23
118 - 122	26	15	21	2	64
113 - 117	37	20	27	10	94
108 - 112	60	45	35	15	155
103 - 107	57	52	41	15	165
98 - 102	63	48	28	16	155
93 - 97	30	29	23	30	112
88 - 92	22	11	10	22	65
83 - 87	6	7	3	14	30
78 - 82	2	1	-	4	7
73 - 77	2	-	-	2	4
- 72	1	-	-	-	1
	330	237	204	132	903



Female Group

Table IX shows the frequency distributions of linguistic intelligence quotients for the total female group (822 individuals) and for the various school groups which compose the total female sample. The histographic representation of the frequency distribution of the intelligence quotients for the total female group appears below Table IX. As shown in Table X, the mean intelligence quotient for this group is 105.425 with a probable error of ±.249 and that the median intelligence quotient is 104.730 with a probable error of ±.311. The standard deviation for the distribution is 10.605 and the measure of skewness is +.197.

Table X

Mean........................	105.425
Probable error (mean).........	±.249
Median........................	104.730
Probable error (median).......	±.311
Upper quartile (Q_3)..........	112.317
Lower quartile (Q_1)..........	97.891
Semi-interquartile range......	7.213
Standard deviation............	10.605
Skewness (β_1).................	+.197

Note:- The parameters which appear in the above Table refer to the frequency distribution of linguistic intelligence quotients (total female group)

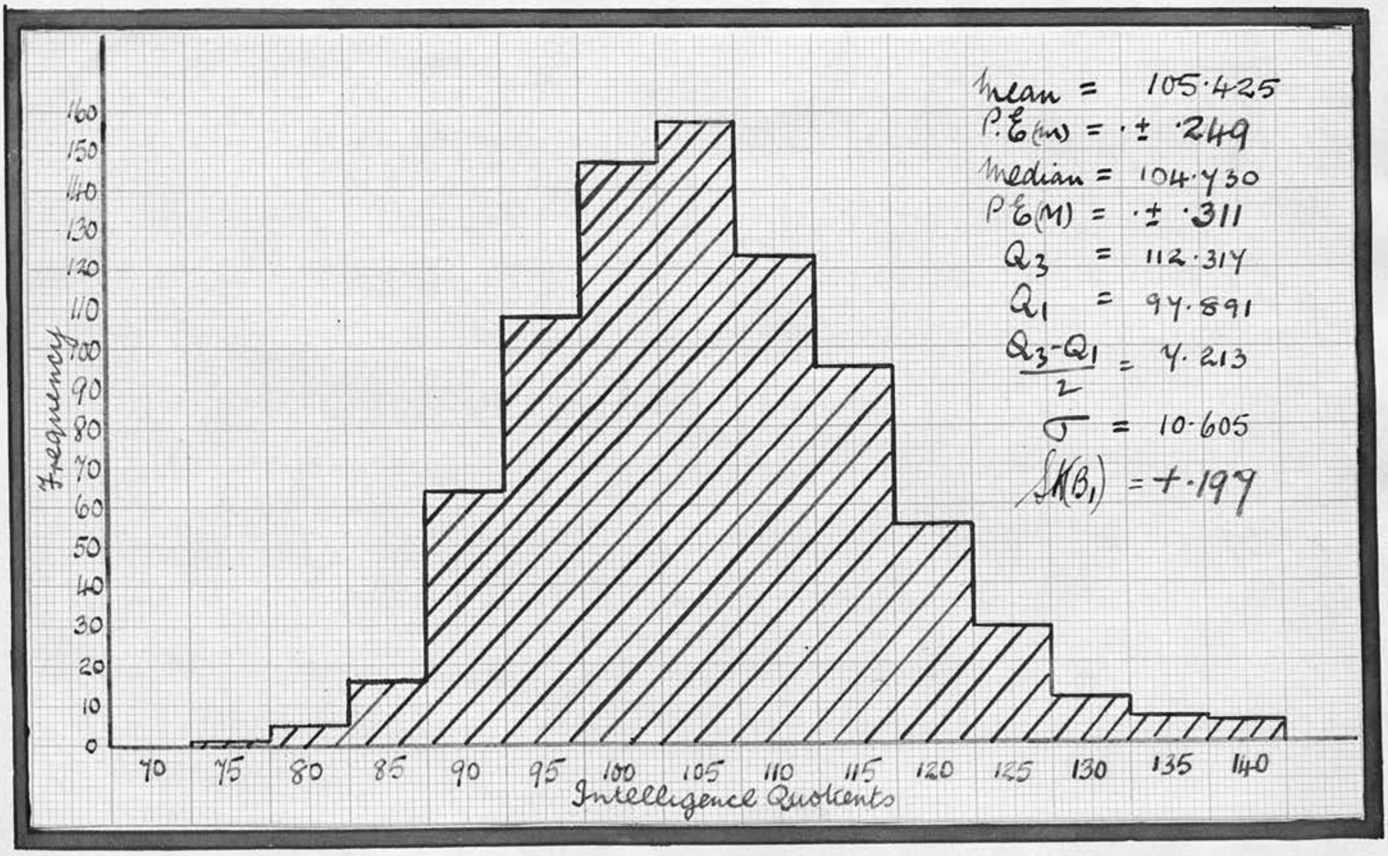
Sex differences

There is no significant difference between the mean intelligence

DISTRIBUTION OF INTELLIGENCE QUOTIENTS

(Female)

I.Q.	School				Total
	T	B	J.C.	D.K.	
138 -	4	-	1	-	5
133 - 137	3	-	3	-	6
128 - 132	8	-	3	-	11
123 - 127	11	9	7	2	29
118 - 122	20	14	19	2	55
113 - 117	37	28	23	7	95
108 - 112	48	32	34	9	123
103 - 107	69	39	39	10	157
98 - 102	52	42	27	26	147
93 - 97	46	33	14	15	108
88 - 92	28	13	12	11	64
83 - 87	5	2	3	6	16
78 - 82	2	-	1	2	5
73 - 77	1	-	-	-	1
- 72	-	-	-	-	-
	334	212	186	90	822



quotients of the male and female groups.

Total Group - Male and Female

Table XI shows the distribution of linguistic intelligence quotients for the total group and the distributions for the various individual school groups. The histographic representation of the frequency distribution for the total group appears on the following page. Table XII shows that the mean intelligence quotient for the group is 105.276 with a probable error of ±.175 and that the median intelligence quotient is 104.790 with a probable error of ±.219. The standard deviation for the distribution if 10.800 while the measure of skewness has a value of +.135.

One of the most interesting features of the frequency distributions of linguistic intelligence quotients is the surprisingly low standard deviation. This is, however, not the fault of the test but rather of the group. The sample of the 13 - 14 school population which was tested in this scheme of vocational guidance was, of necessity, a selected one. The schools chosen for this investigation come under the general heading of Advanced Division or Intermediate and this type of school contains pupils who have passed through the Primary Schools and who intend, in the great majority of cases, to leave school on attaining the minimum statutory school-leaving age. Pupils, on the other hand, who have shown particular promise in the Primary Schools and who are above average intelligence usually go to a Secondary School for a minimum period of three years, while the pupils who are borderline and below borderline intelligence usually are sent to Special Schools and never reach the Advanced Division or Secondary Schools. The group tested is, therefore, somewhere between the two extremes, so that one would expect to find a standard deviation which is less than the

DISTRIBUTION OF INTELLIGENCE QUOTIENTS

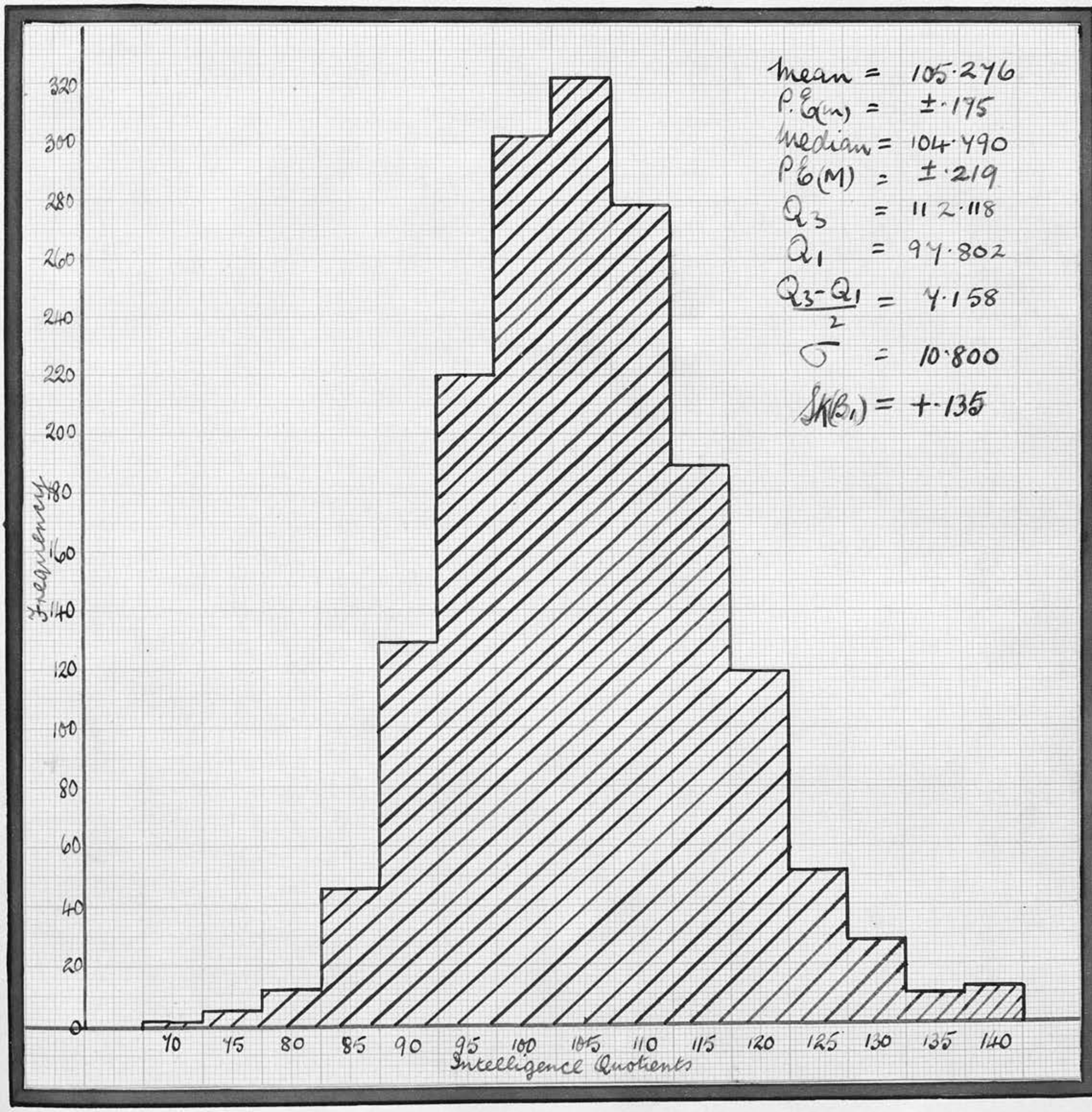
(Male and Female)

I.Q.	School				Total
	T	B	J.C.	D.K.	
138 -	5	2	5	-	12
133 - 137	5	1	3	1	10
128 - 132	15	3	9	1	28
123 - 127	25	12	13	2	52
118 - 122	46	29	40	4	119
113 - 117	74	48	50	17	189
108 - 112	108	77	69	24	278
103 - 107	126	91	80	25	322
98 - 102	115	90	55	42	302
93 - 97	76	62	37	45	220
88 - 92	50	24	22	33	129
83 - 87	11	9	6	20	46
78 - 82	4	1	1	6	12
73 - 77	3	-	-	2	5
- 72	1	-	-	-	1
	664	449	390	222	1725

Table XII

Mean........................	105.276
Probable error (mean)........	±.175
Median......................	104.790
Probable error (median)......	±.219
Upper quartile (Q_3)..........	112.118
Lower quartile (Q_1)..........	97.802
Semi-interquartile range.....	7.158
Standard deviation...........	10.800
Skewness (β_1)...............	+.135

HISTOGRAM OF DATA CONTAINED IN TABLE



generally accepted figure of fifteen.

RATINGS FOR LINGUISTIC INTELLIGENCE TEST

Table XIII

I.Q.	Rating
138 -	A+
133 - 137	A
128 - 132	A-
123 - 127	B+
118 - 122	B
113 - 117	B-
108 - 112	C+
103 - 107	C
98 - 102	C-
93 - 97	D+
88 - 92	D
83 - 87	D-
78 - 82	E+
73 - 77	E
- 72	E-

Note:- In the calculation of intelligence quotients a maximum basal chronological age of 192 months (16 years) was used for this test.

The original Kuhlmann-Anderson Norms are shown on pages 107 - 108 : Appendix A.

PRACTICAL INTELLIGENCE (Raw Scores)

Male Group

Table XV shows the distribution of raw scores in the practical intelligence test for the total male group and for the individual school groups. As shown in Table XIV, the mean raw score is 93.380 ±.719 and the median raw score is 90.333 ±.899. The standard deviation is 32.937 and the measures of skewness has a value of +.277.

It will probably be remembered that the total raw score is arrived at by adding together the scores in the three individual sub-tests which compose the practical intelligence test battery, viz. efficiency score in the Oakley Formboard Test plus twice the score in the Koh's Block Design Test plus the score in the Cube Construction Test.

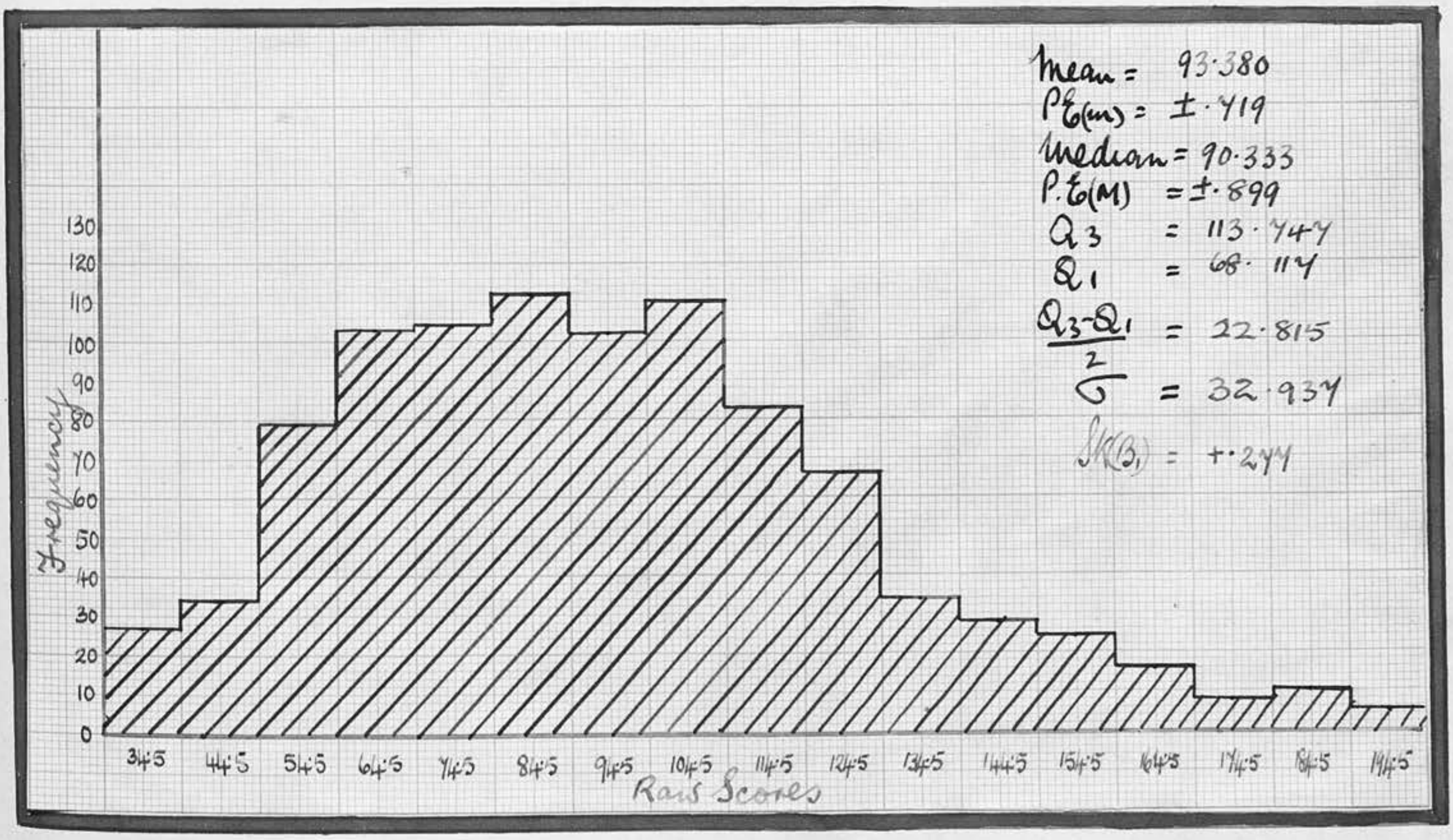
Table XIV

Mean............................	93.380
Probable error (mean)...........	±.719
Median..........................	90.333
Probable error (median).........	±.899
Upper quartile (Q_3).............	113.747
Lower quartile (Q_1)............	68.117
Semi-interquartile range........	22.815
Standard deviation..............	32.937
Skewness (β_1)..................	+.277

Note:- The parameters in the above Table refer to the total frequency distribution of raw scores (Total Male Group).

DISTRIBUTION OF PRACTICAL INTELLIGENCE RAW SCORES (MALE)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
190 -	1	1	1	2	5
180 - 189	3	5	2	-	10
170 - 179	3	2	3	-	8
160 - 169	7	4	3	2	16
150 - 159	13	7	3	1	24
140 - 149	5	9	9	5	28
130 - 139	14	7	9	4	34
120 - 129	19	25	11	11	66
110 - 119	26	29	16	12	83
100 - 109	36	37	26	11	110
90 - 99	38	24	21	19	102
80 - 89	37	30	25	20	112
70 - 79	52	19	17	16	104
60 - 69	43	25	22	13	103
50 - 59	26	22	26	15	89
40 - 49	8	5	9	12	34
- 39	7	7	3	10	27
	338	258	206	153	955



Female Group

Table XVII shows the frequency distribution of raw practical intelligence scores for the total female group and the frequency distributions for the individual school groups. The histographic representation of the distribution of raw scores for the total female group appears on the same page. Table XVI shows that the mean raw score for the group is 78.282 $\pm$.609 and the median raw score is 74.292 $\pm$.761. The standard deviation for the group is 19.244 and β_1 has a value of +.446. The other parameters pertaining to the distribution are shown below in Table XVI.

Table XVI

Mean..........................	78.282
Probable error (mean).........	$\pm$.609
Median........................	74.292
Probable error (median).......	$\pm$.761
Upper quartile (Q_3)...........	96.151
Lower quartile (Q_1)...........	57.664
Semi-interquartile range......	19.244
Skewness (β_1).................	+.446

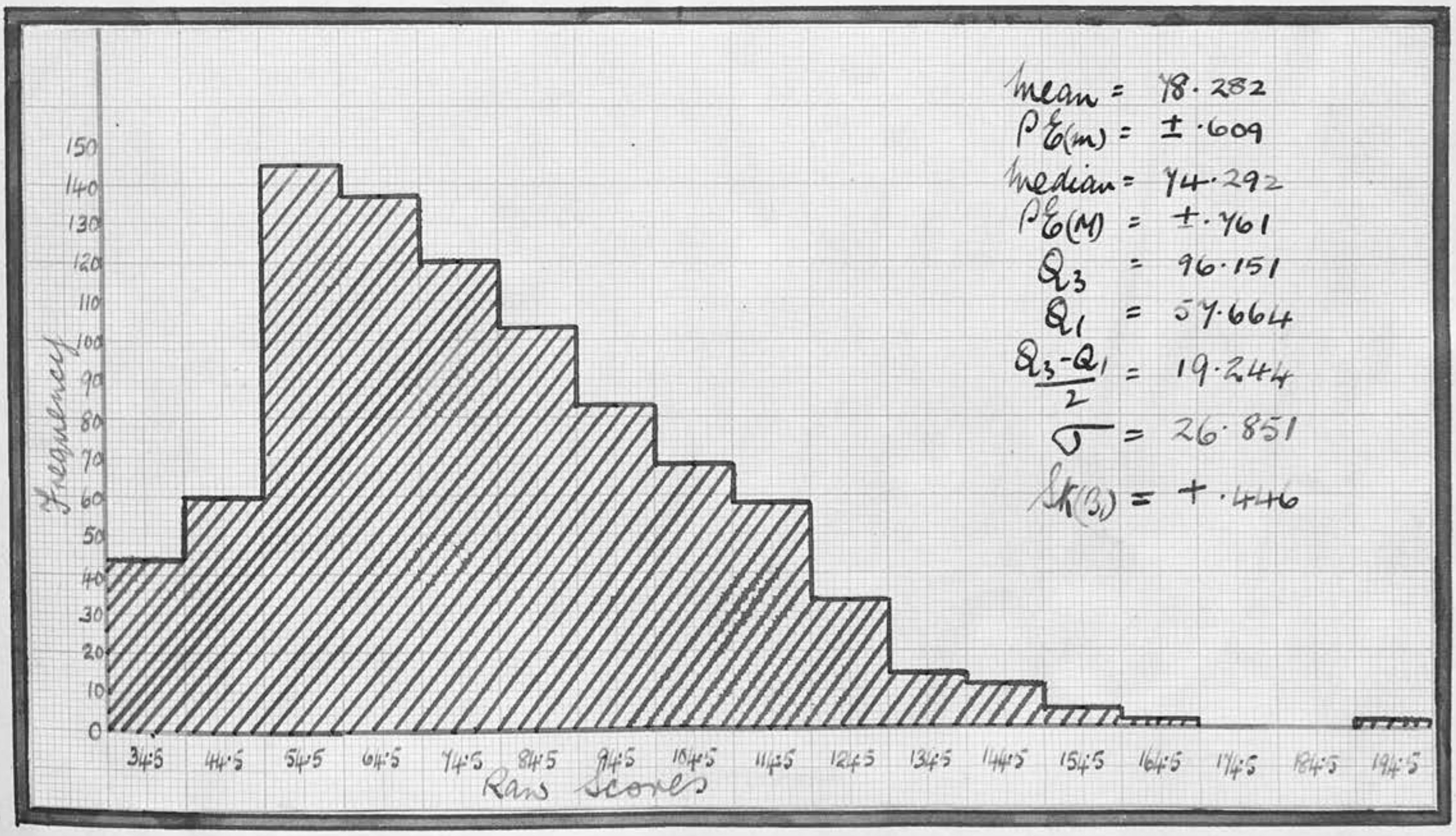
Sex differences

The mean raw scores for the male and female groups are significantly different and it is therefore necessary to construct separate norms for boys and girls. It is interesting to note that the measures of skewness for the two distributions are also significantly

DISTRIBUTION OF PRACTICAL INTELLIGENCE RAW SCORES

(Female)

Raw Scores	School T	School B	School J.C.	School D.K.	Total
190 -	1	1	-	-	2
180 - 189	-	-	-	-	-
170 - 179	-	-	-	-	-
160 - 169	-	-	-	2	2
150 - 159	2	1	1	1	5
140 - 149	6	3	1	1	11
130 - 139	8	3	2	1	14
120 - 129	14	12	4	3	33
110 - 119	23	19	12	4	58
100 - 109	25	19	16	8	68
90 - 99	30	24	18	11	83
80 - 89	44	24	22	13	103
70 - 79	46	32	29	13	120
60 - 69	53	33	35	16	137
50 - 59	56	35	30	22	143
40 - 49	27	12	16	5	60
- 39	17	9	11	7	44
	352	227	197	107	883



DISTRIBUTION OF PRACTICAL INTELLIGENCE RAW SCORES

(Male and Female)

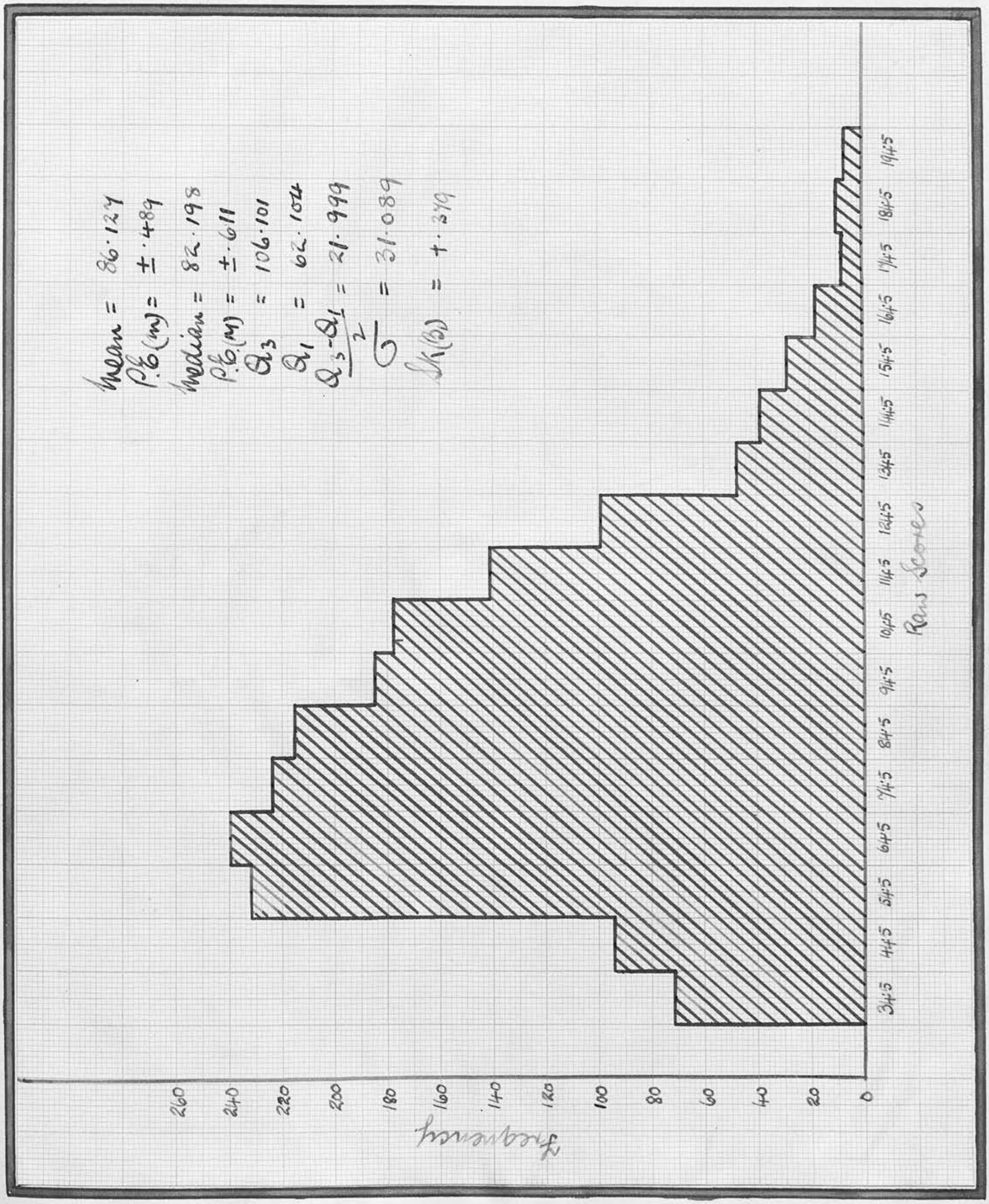
Raw Scores	School				Total
	T	B	J.C.	D.K.	
190 -	2	2	1	2	7
180 - 189	3	5	2	-	10
170 - 179	3	2	3	-	8
160 - 169	7	4	3	4	18
150 - 159	15	8	4	2	29
140 - 149	11	12	10	6	39
130 - 139	22	10	11	5	48
120 - 129	33	37	15	14	99
110 - 119	49	48	28	16	141
100 - 109	61	56	42	19	178
90 - 99	68	48	39	30	185
80 - 89	81	54	47	33	215
70 - 79	98	51	46	29	224
60 - 69	96	58	57	29	240
50 - 59	82	57	56	37	232
40 - 49	35	17	25	17	94
- 39	24	16	14	17	71
	690	485	403	260	1838

Table XIX

Mean........................	86.127
Probable error (mean)........	±.489
Median......................	82.198
Probable error (median).......	±.611
Upper quartile (Q_3)..........	106.101
Lower quartile (Q_1)..........	62.104
Semi-interquartile range......	21.999
Standard deviation...........	31.089
Skewness (β_1)................	+.379

Note:- The parameters which appear in the above Table refer to the frequency distribution of raw scores for the Total Group - Male and Female

HISTOGRAM OF DATA CONTAINED IN TABLE



different and this would seem to indicate that the test is more difficult for girls than it is for boys. An appreciable degree of the skewness found in the two distributions is probably due to the time factor which invariably induces positive skewness in a distribution.

In the construction of norms for the practical intelligence we have noted that the standard deviation of the distribution of raw scores for the male group is greater than the corresponding value for the female group. A standard deviation of 16 has been adopted for the male group and one of 15 for the female group.

Total Group - Male and Female

Table XVIII shows the frequency distribution of total raw scores for the total group and the distributions for the various individual school groups. The histographic representation of the frequency distribution for the total group appears on the following page. As shown in Table XIX, the mean raw score for the group is 86.127 with a probable error of ±.489 and the median raw score is 82.198 with a probable error of ±.611. The standard deviation for this distribution has a value of 31.089, while the measure of skewness is positive, viz. +.379.

Note:- The norms for the Practical Intelligence Test are shown on Pages 109 - 110: Appendix A.

PRACTICAL INTELLIGENCE (Intelligence Quotients)

Male Group

Table XX shows the distributions of practical intelligence quotients for the male group and for the individual school groups which compose it. The histographic representation of the frequency distribution of practical intelligence quotients is to be found below Table XX. As shown in Table XXI, the mean intelligence quotient for the group is 99.980 with a probable error of ±.359 and the median intelligence quotient is 99.827 with a probable error of ±.449. The standard deviation for the distribution is 16.470 and the measure of skewness is +.028.

Table XXI

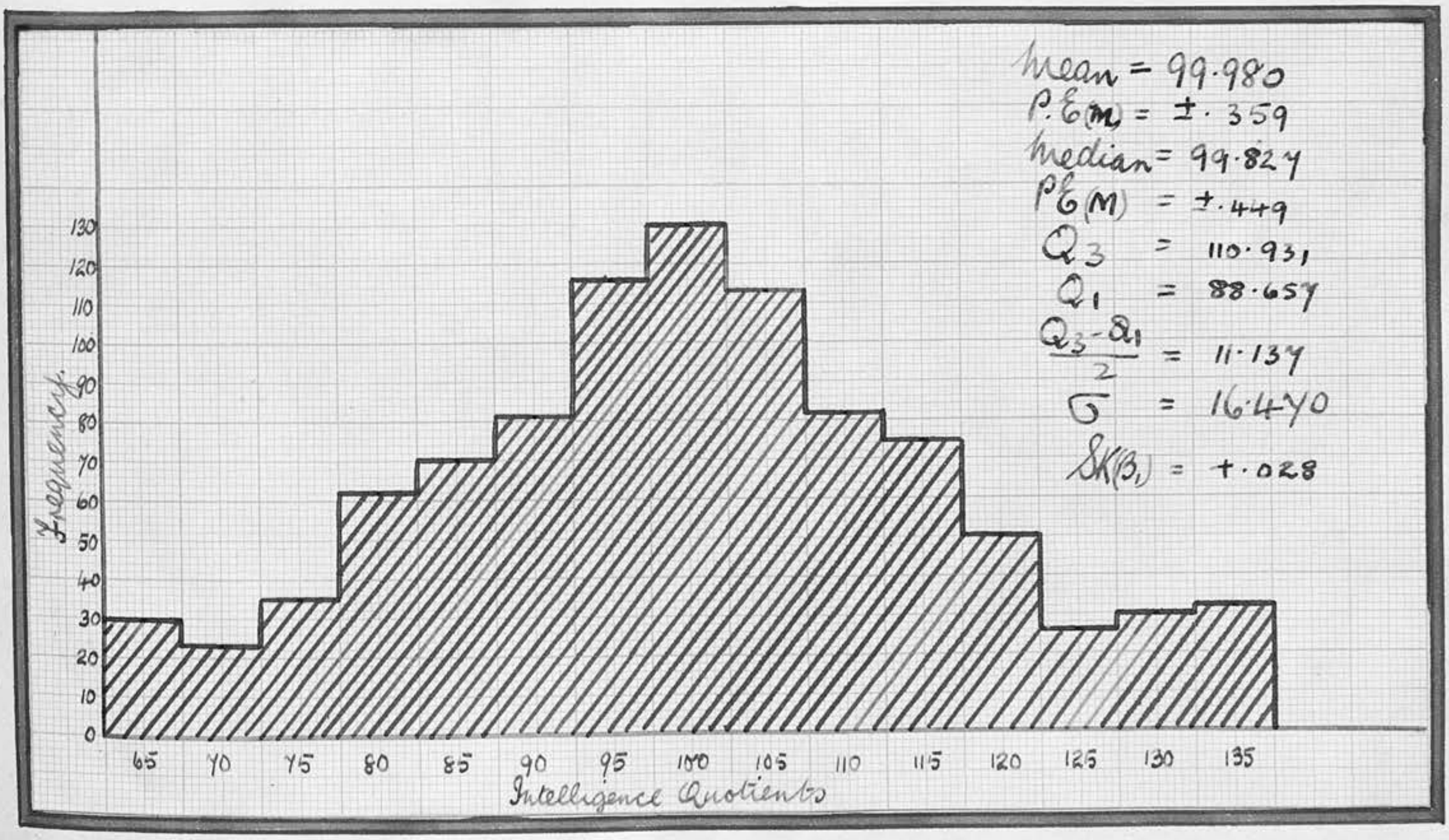
Mean..........................	99.980
Probable error (mean).........	±.359
Median........................	99.827
Probable error (median).......	±.449
Upper quartile (Q_3)...........	110.931
Lower quartile (Q_1)...........	88.657
Semi-interquartile range......	11.137
Standard deviation............	16.470
Skewness (β_1)..................	+.028

Note:- The parameters in the above Table refer to the frequency distribution of practical intelligence quotients for the Total Male Group.

DISTRIBUTION OF PRACTICAL INTELLIGENCE QUOTIENTS

(Male)

I.Q.	School				Total
	T	B	J.C.	D.K.	
133 -	11	11	6	4	32
128 - 132	12	10	6	2	30
123 - 127	10	8	4	4	26
118 - 122	16	13	14	7	50
113 - 117	17	32	17	9	75
108 - 112	38	25	11	8	82
103 - 107	40	33	28	12	113
98 - 102	47	27	28	28	130
93 - 97	43	26	26	21	116
88 - 92	34	24	12	11	81
83 - 87	28	18	15	9	70
78 - 82	20	16	17	9	62
73 - 77	12	6	10	7	35
68 - 72	3	3	7	10	23
- 67	7	6	5	12	30
	338	258	206	153	955



Female Group

Table XXIII shows the distribution of practical intelligence quotients for the total female group and the distributions for the respective school groups. The histographic representation of the frequency distribution of practical intelligence quotients for the female group is to be found below Table XXIII. Table XXII shows that the mean intelligence quotient for the group is 99.790 ±.359 and that the median intelligence quotient is 99.197 ±.449. The standard deviation for the group is 15.815 and β_1 is +.113.

Table XXII

Mean.........................	99.790
Probable error (mean)........	±.359
Median.......................	99.197
Probable error (median)......	±.449
Upper quartile (Q_3)..........	109.561
Lower quartile (Q_1)..........	88.750
Semi-interquartile range.....	10.406
Standard deviation...........	15.815
Skewness (β_1)................	+.113

Note:- The parameters in the above Table refer to the frequency distribution of practical intelligence quotients for the Total Female Group.

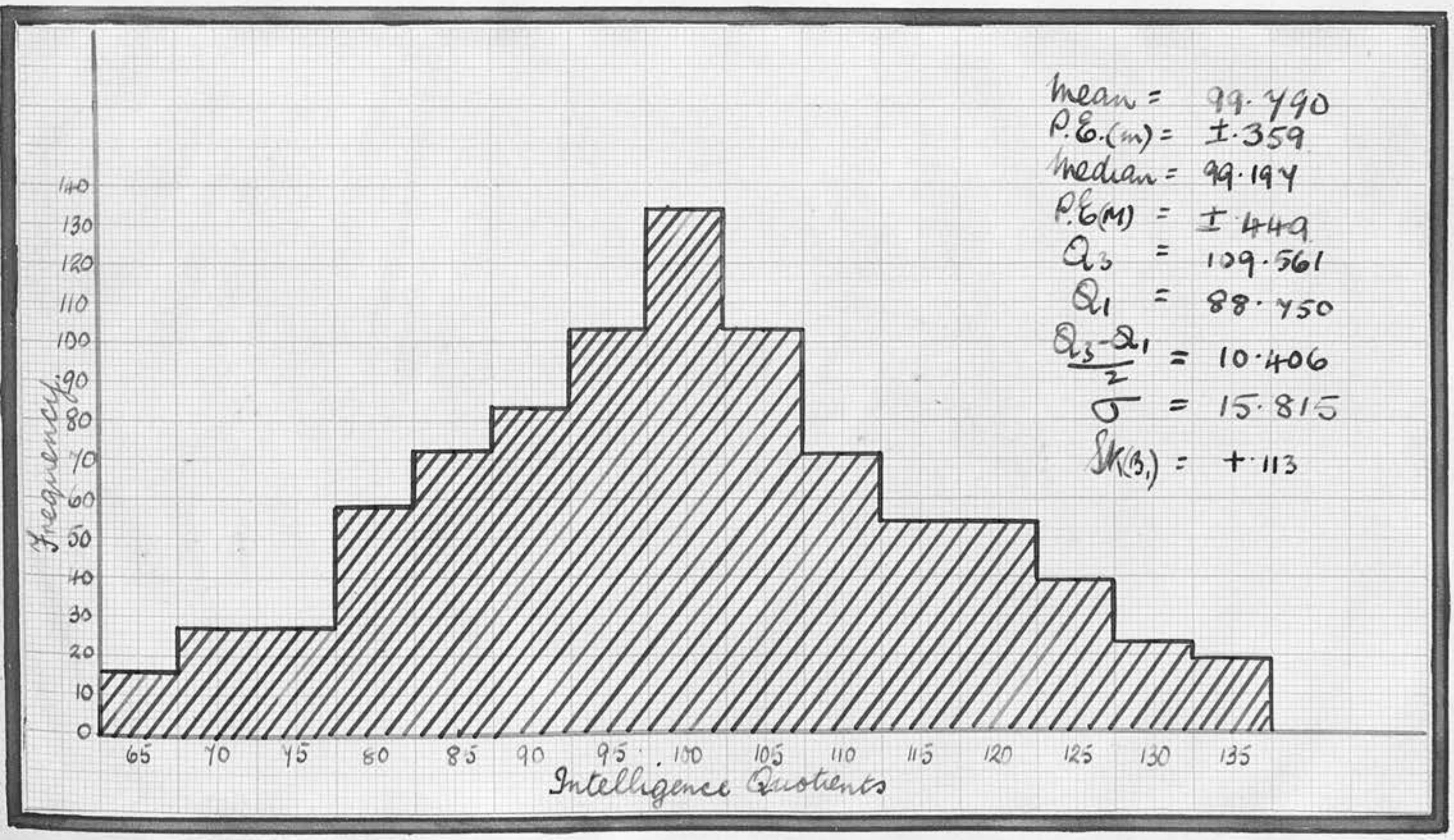
Sex differences

There is no significant difference between the mean practical intelligence quotients of the male and female groups, but there is still

DISTRIBUTION OF PRACTICAL INTELLIGENCE QUOTIENTS

(Female)

I.Q.	School T	B	J.C.	D.K.	Total
133 -	7	6	2	4	19
128 - 132	11	8	3	1	23
123 - 127	18	12	6	3	39
118 - 122	20	15	13	6	54
113 - 117	20	19	12	3	54
108 - 112	30	17	16	8	71
103 - 107	43	24	27	9	103
98 - 102	47	37	37	13	134
93 - 97	42	24	23	14	103
88 - 92	31	18	21	13	83
83 - 87	26	19	14	13	72
78 - 82	26	10	10	12	58
73 - 77	17	8	1	1	27
68 - 72	10	4	8	5	27
- 67	4	6	4	2	16
	352	227	197	107	883



a significant difference as far as skewness is concerned, indicating that, while standardisation has to a great extent nullified the degree of skewness in the distribution of raw practical intelligence scores of the male group, it is still present in the distribution of practical intelligence quotients of the female group.

Total Group - Male and Female

Table XXIV shows the frequency distribution of practical intelligence quotients for the total group and the corresponding distributions for the individual school groups. The histogram of the total frequency distribution appears on the following page. As shown in Table XXV, the mean practical intelligence quotient for the group is 99.837 with a probable error of ±.254 while the median practical intelligence quotient is 99.697 with a probable error of ±.318. The standard deviation for the distribution is 16.160.

The ratings which were used for the practical intelligence test are to be found below in Table XXVI.

RATINGS FOR PRACTICAL INTELLIGENCE TEST

Table XXVI

I.Q.	Rating
133 -	A+
128 - 132	A
123 - 127	A-
118 - 122	B+
113 - 117	B
108 - 112	B-
103 - 107	C+
98 - 102	C
93 - 97	C-
88 - 92	D+
83 - 87	D
78 - 82	D-
73 - 77	E+
68 - 72	E
- 67	E-

DISTRIBUTION OF PRACTICAL INTELLIGENCE QUOTIENTS

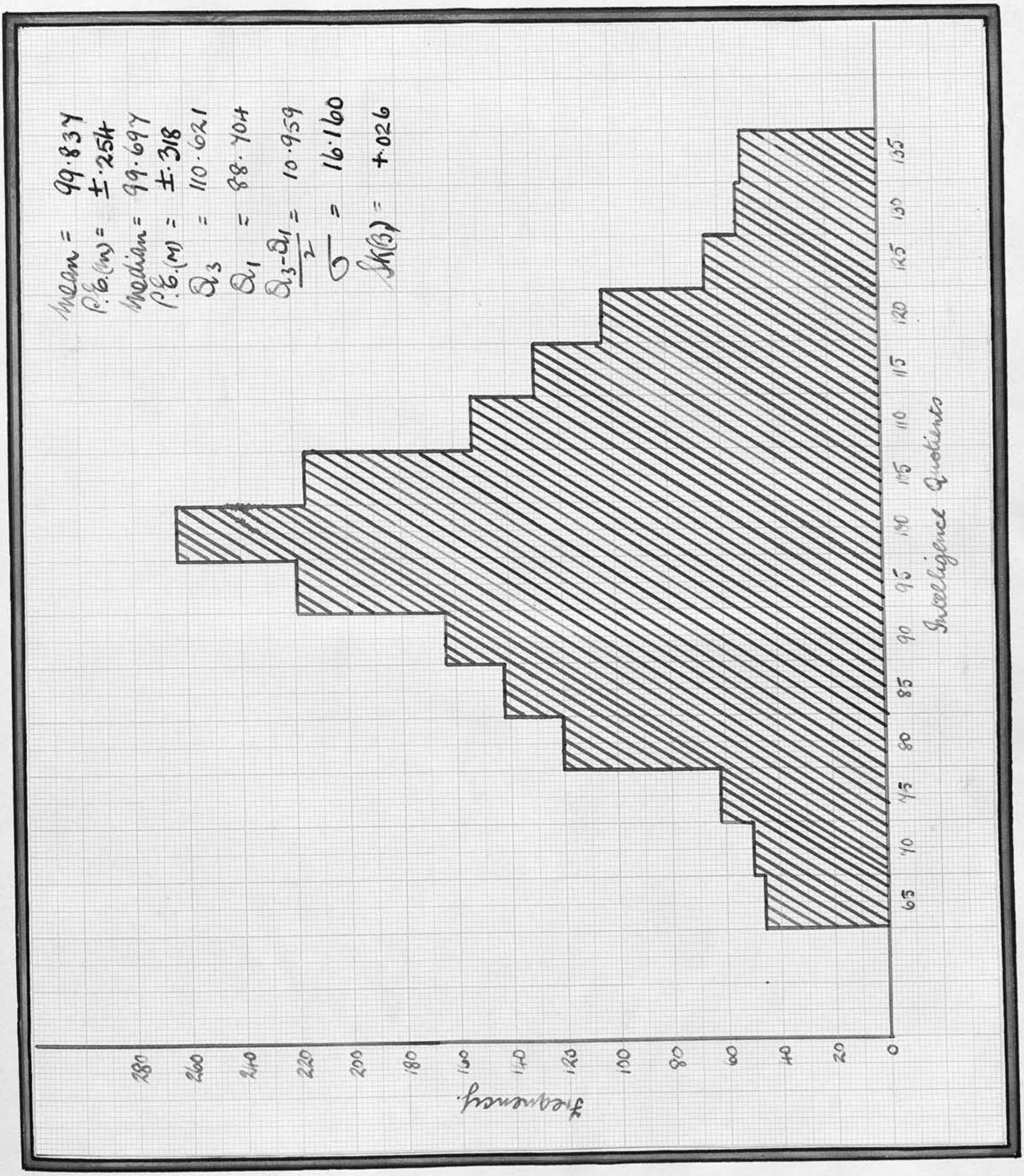
(Male and Female)

I.Q.	School				Total
	T	B	J.C.	D.K.	
133 -	18	17	8	8	51
128 - 132	23	18	9	3	53
123 - 127	28	20	10	7	65
118 - 122	36	28	27	13	104
113 - 117	37	51	29	12	129
108 - 112	68	42	27	16	153
103 - 107	83	57	55	21	216
98 - 102	94	54	65	41	264
93 - 97	85	50	49	35	219
88 - 92	65	42	33	24	164
83 - 87	54	37	29	22	142
78 - 82	46	26	27	21	120
73 - 77	29	14	11	8	62
68 - 72	13	7	15	15	50
- 67	11	12	9	14	46
	690	485	406	260	1838

Table XXV

Mean.........................	99.837
Probable error (mean).........	$\pm$.254
Median.......................	99.697
Probable error (median).......	$\pm$.318
Upper quartile (Q_3)..........	110.621
Lower quartile (Q_1)..........	88.704
Semi-interquartile range......	10.959
Standard deviation...........	16.160
Skewness (β_1)................	+.026

HISTOGRAM OF DATA CONTAINED IN TABLE



MECHANICAL APTITUDE (Raw Scores)

Male Group

Table XXVIII shows the distribution of raw mechanical aptitude scores for the male group and the corresponding distributions for the school groups. The histographic representation of the distribution of raw scores for the male group appears below Table XXVIII. As shown in Table XXVII, the mean raw score for the group is 12.181 with a probable error of ±.099 and the median raw score is 11.796 with a probable error of ±.124. The standard deviation is 4.368 and the distribution is positively skew.

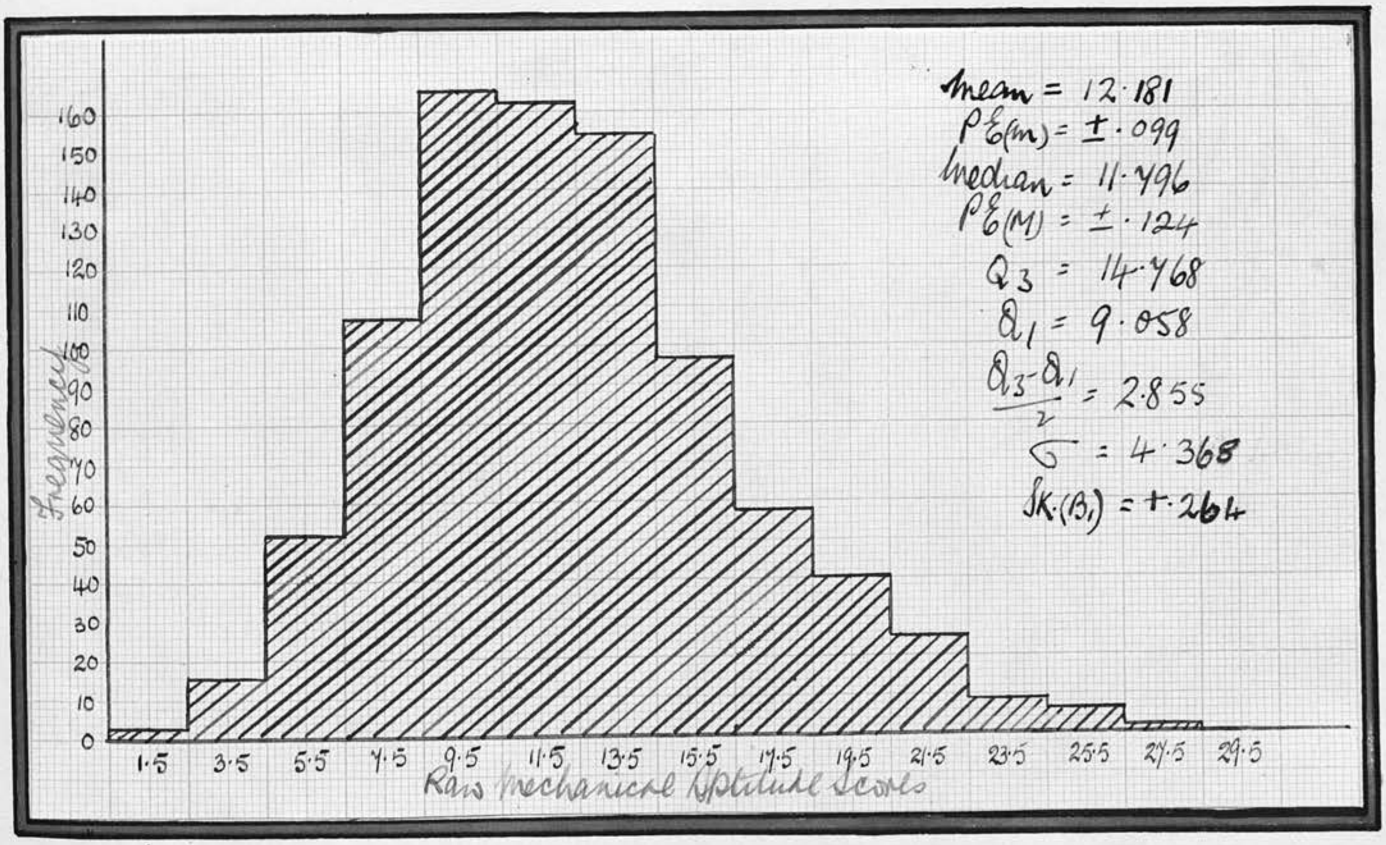
Table XXVII

Mean..........................	12.181
Probable error (mean).........	±.099
Median........................	11.796
Probable error (median).......	±.124
Upper quartile (Q_3)...........	14.768
Lower quartile (Q_1)...........	9.058
Semi-interquartile range......	2.855
Standard deviation............	4.368
Skewness (β_1).................	+.264

Note:- The parameters in the above Table refer to the frequency distribution of raw methanical aptitude scores of the Total Male Group

DISTRIBUTION OF MECHANICAL APTITUDE RAW SCORES (MALE)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
29 - 30	-	-	-	-	-
27 - 28	-	2	-	-	2
25 - 26	-	6	-	-	6
23 - 24	1	7	-	1	9
21 - 22	5	15	2	3	25
19 - 20	9	22	2	7	40
17 - 18	23	22	6	7	58
15 - 16	35	39	15	8	97
13 - 14	54	46	40	14	154
11 - 12	61	29	43	29	162
9 - 10	59	41	38	27	165
7 - 8	46	13	31	17	107
5 - 6	18	5	16	13	52
3 - 4	4	1	4	7	16
1 - 2	2	-	1	-	3
	317	248	198	133	896
%	93·8%	96·1%	96·1%	86·9%	93·8%



Female Group

Table XXX shows the frequency distributions of raw mechanical aptitude scores for the female group and for the various individual schools which compose the group, the histographic representation of the total frequency appearing below Table XXX. Table XXIX shows that the mean raw score for the group is 9.379 with a probable error of ±.087 and that the median raw score is 9.206 with a probable error of ±.109. The standard deviation for the distribution is 3.582 and it is positively skew, β_1 having a value of +.145.

Table XXIX

Mean........................	9.379
Probable error (mean).......	±.087
Median......................	9.206
Probable error (median).....	±.109
Upper quartile (Q_3).........	11.958
Lower quartile (Q_1).........	6.452
Semi-interquartile range.....	2.753
Standard deviation..........	3.582
Skewness (β_1)...............	+.145

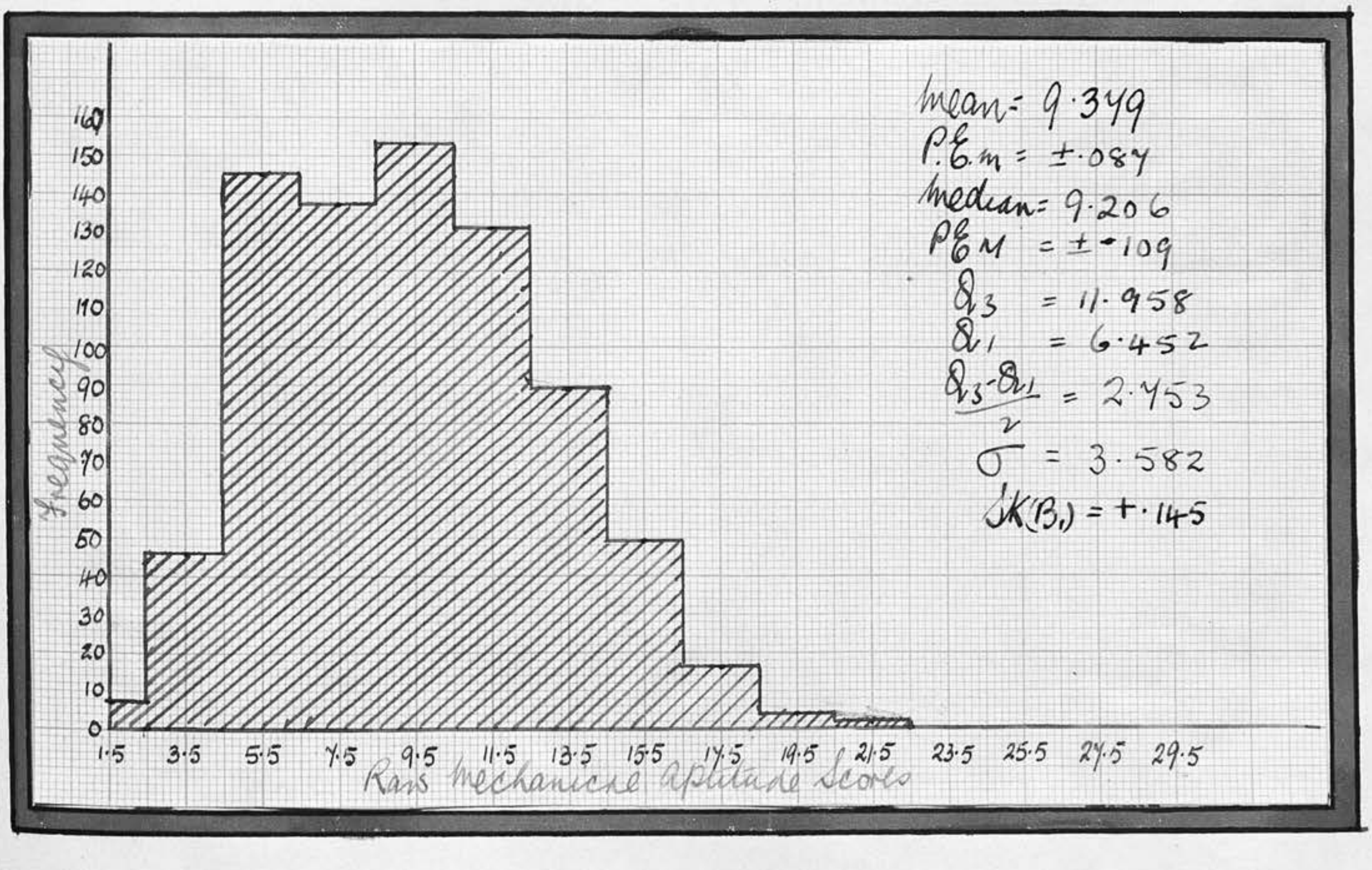
Note:- The parameters in the above Table refer to the frequency distribution of raw mehcanical aptitude scores of the Total Female Group.

Sex differences

The mean raw scores for the male and female groups are significantly different and this necessitates the construction of

DISTRIBUTION OF MECHANICAL APTITUDE RAW SCORES (FEMALE)

Raw Scores	School T	School B	School J.C.	School D.K.	Total
29 - 30	-	-	-	-	-
27 - 28	-	-	-	-	-
25 - 26	-	-	-	-	-
23 - 24	-	-	-	-	-
21 - 22	-	1	-	-	1
19 - 20	-	2	-	2	4
17 - 18	2	13	-	1	16
15 - 16	9	21	6	13	49
13 - 14	15	46	13	15	89
11 - 12	41	50	25	15	131
9 - 10	63	43	29	18	153
7 - 8	62	20	44	11	137
5 - 6	81	11	42	11	145
3 - 4	23	2	17	4	46
1 - 2	4	-	3	-	7
	300	209	179	90	778
%	85·2%	92·1%	90·9%	84·1%	88·1%



separate norms for boys and girls. It should be noted that the norms, which appear on pages 111 - 117 : Appendix A, have not been constructed entirely on the basis of the data obtained in the present investigation. The writer, previous to the commencement of this scheme of vocational guidance, tested some 2000 pupils, an entirely different group from the present one, with Cox's Mechanical Aptitude Test and has been able to construct norms for boys (C.A. 120 - 191 months) and for girls (C.A. 150 - 185 months). See pages 111 - 117 : Appendix A.

Total Group - Male and Female

Table XXXI shows the distribution of raw mechanical aptitude scores for the total group and for the individual school groups composing it. The histographic representation of the distribution for the total group appears on the page following Table XXXI. As shown in Table XXXII, the mean raw score is 10.879 with a probable error of ±.070 and the median score is 10.541 with a probable error of ±.083. The standard deviation for the group is 4.262 and $_1$ is positive.

The fact that the measure of skewness is positive would seem to indicate that the test is probably too difficult for the group concerned in this scheme. Nevertheless, the theory might be formulated that skewness is not so much a manifestation of the degree of difficulty of the mechanical aptitude test but rather of the degree of specificity of mechanical aptitude, since it is not infrequently found that the more specific the aptitude the more skew is the distribution of the scores in that particular aptitude test.

In the construction of norms for this test a standard deviation of <u>fifteen</u> has been provisionally selected for boys and one of <u>fourteen</u> for girls.

DISTRIBUTION OF RAW MECHANICAL APTITUDE SCORES

(Male and Female)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
29 - 30	-	-	-	-	-
27 - 28	-	2	-	-	2
25 - 26	-	6	-	-	6
23 - 24	1	7	-	1	9
21 - 22	5	16	2	3	26
19 - 20	9	24	2	9	44
17 - 18	25	35	6	8	74
15 - 16	44	60	21	21	146
13 - 14	69	92	53	29	243
11 - 12	102	79	68	44	293
9 - 10	122	84	67	45	318
7 - 8	108	33	75	28	244
5 - 6	99	16	58	24	197
3 - 4	27	3	21	11	62
1 - 2	6	-	4	-	10
	617	457	377	223	1674
%	89·4%	94·2%	93·6%	85·8%	91·07%

Table XXXII

Mean........................ 10.879

Probable error (mean)......... ±.070

Median...................... 10.541

Probable error (median)....... ±.088

Upper quartile (Q_3).......... 13.582

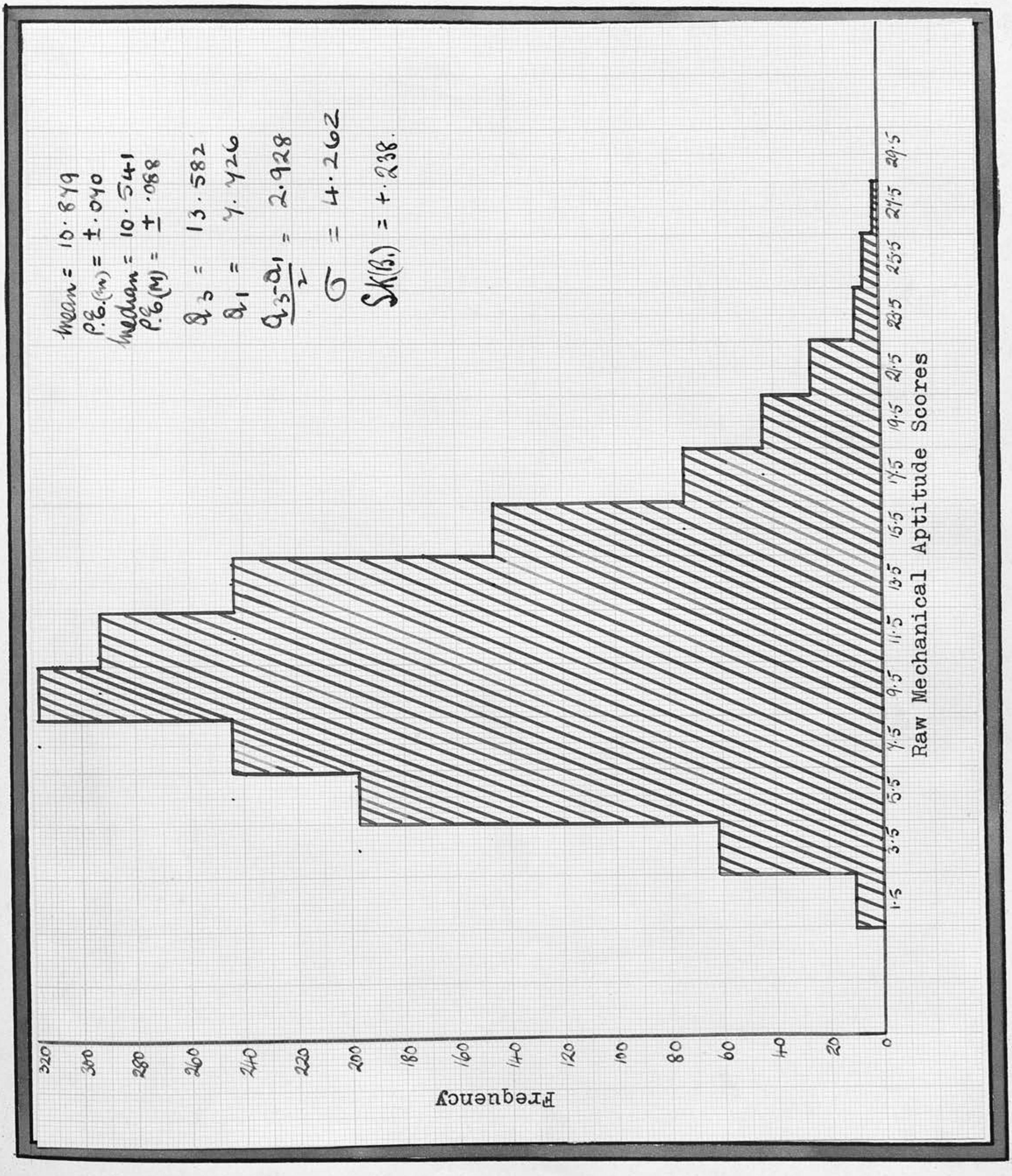
Lower quartile (Q_1).......... 7.726

Semi-interquartile range...... 2.928

Standard deviation............ 4.262

Skewness (β_1)................ +.238

HISTOGRAM OF DATA CONTAINED IN TABLE



MECHANICAL APTITUDE (Standardised Scores)

Male Group

Table XXXIV shows the frequency distributions of standardised mechanical aptitude scores for the male group and for the individual school groups composing it. The histogram of the frequency distribution for the male group is to be found below Table XXXIV. Table XXXIII shows that the mean standardised score for the group is 99.410 with a probable error of ±.302 and that the median standardised score is 99.669 with a probable error of ±.378. The standard deviation for the distribution is 13.415 and the measure of skewness has a value of -.058.

Table XXXIII

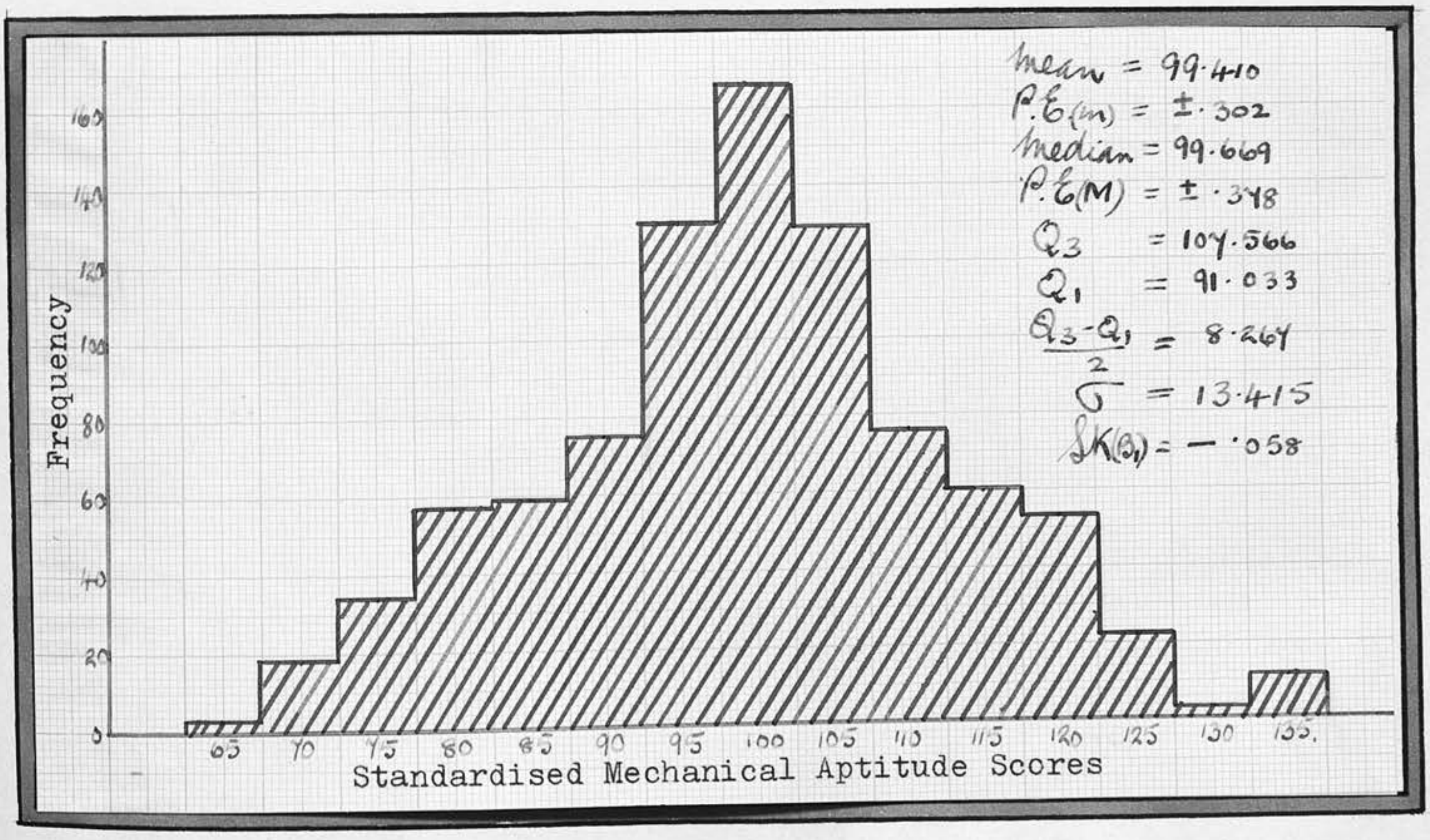
Mean..........................	99.410
Probable error (mean)..........	±.302
Median........................	99.669
Probable error (median)........	±.378
Upper quartile (Q_3)............	107.566
Lower quartile (Q_1)............	91.033
Semi-interquartile range.......	8.267
Standard deviation............	13.415
Skewness (β_1)..................	-.058

Note:- The above parameters refer to the frequency distribution of standardised mechanical aptitude Total Male Group

DISTRIBUTION OF STANDARDISED MECHANICAL APTITUDE SCORES

(Male)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	1	10	-	-	11
128 - 132	-	3	-	-	3
123 - 127	5	13	1	3	22
118 - 122	12	30	3	8	53
113 - 117	23	28	-	9	60
108 - 112	24	26	19	7	76
103 - 107	44	48	27	10	129
98 - 102	65	36	46	19	166
93 - 97	52	21	27	30	130
88 - 92	28	14	21	12	75
83 - 87	21	10	20	8	59
78 - 82	23	4	19	11	57
73 - 77	13	4	9	8	34
68 - 72	4	1	5	8	18
- 67	2	-	1	-	3
	317	248	198	133	896



Female Group

Table XXXVI shows the distributions of standardised mechanical aptitude scores for the female group and for the individual school groups. The histogram of the frequency distribution for the female group appears below this Table. As shown in Table XXXV below, the mean standardised score for the group is 98.618 with a probable error of ±.349 and the median standardised score is 99.086 with a probable error of ±.436. The standard deviation for the distribution is 14.440 and the measure of skewness is very slightly negative, having a value of -.091.

Table XXXV

Mean........................	98.618
Probable error (mean).......	±.349
Median......................	99.086
Probable error (median)......	±.436
Upper quartile (Q_3)..........	108.220
Lower quartile (Q_1)..........	87.340
Semi-interquartile range.....	10.440
Standard deviation...........	14.440
Skewness (β_1)................	-.091

Note:- The parameters in the above Table refer to the frequency distribution of standardised mechanical aptitude scores Total Female Group.

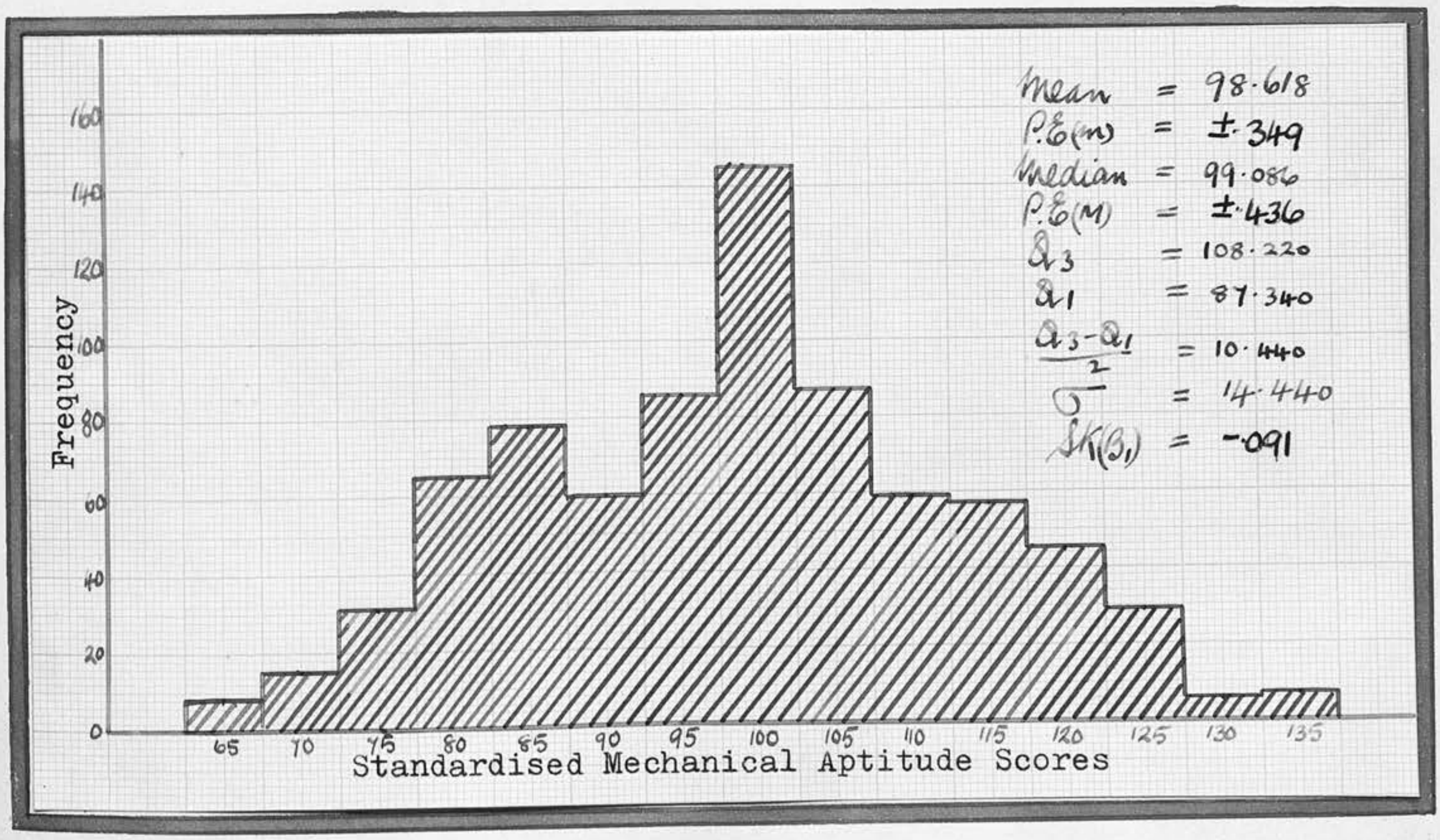
Sex differences:-

There is no significant difference between the mean standardised scores of the male and female groups.

DISTRIBUTION OF STANDARDISED MECHANICAL APTITUDE SCORES

(Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	-	5	-	2	7
128 - 132	1	4	-	1	6
123 - 127	4	17	1	7	29
118 - 122	13	19	8	5	45
113 - 117	11	25	12	9	57
108 - 112	10	29	12	8	59
103 - 107	38	27	14	8	87
98 - 102	43	50	29	23	145
93 - 97	46	11	22	7	86
88 - 92	26	9	21	4	60
83 - 87	45	7	20	6	78
78 - 82	35	4	20	6	65
73 - 77	14	1	13	3	31
68 - 72	9	1	4	1	15
- 67	5	-	3	-	8
	300	209	179	90	778



Total Group - Male and Female

Table XXXVIII shows the frequency distributions of standardised mechanical aptitude scores for the total group and for the total individual school groups. The histographic representation of the frequency distribution for the total group is shown on the following page. Table XXXIX shows that that the mean standardised score for the group is 99.041 with a probable error of ±.229 and the median standardised score if 99.397 with a probable error of ±.286. The standard deviation for the total group is 13.905 and the measure of skewness has a value of -.077.

The ratings which were used for the mechanical aptitude test are shown in Table XXXVII.

RATINGS FOR MECHANICAL APTITUDE TEST

Table XXXVII

Standardised Scores	Rating
133 -	A+
128 - 132	A
123 - 127	A-
118 - 122	B+
113 - 117	B
108 - 112	B-
103 - 107	C+
98 - 102	C
93 - 97	C-
88 - 92	D+
83 - 87	D
78 - 82	D-
73 - 77	E+
68 - 72	E
- 67	E-

DISTRIBUTION OF STANDARDISED MECHANICAL APTITUDE SCORES

(Male and Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	1	15	-	2	18
128 - 132	1	7	-	1	9
123 - 127	9	30	2	10	51
118 - 122	25	49	11	13	98
113 - 117	34	53	12	18	117
108 - 112	34	55	31	15	135
103 - 107	82	75	41	18	216
98 - 102	108	86	75	42	311
93 - 97	98	32	49	37	216
88 - 92	54	23	42	16	135
83 - 87	66	17	40	14	137
78 - 82	58	8	39	17	122
73 - 77	27	5	22	11	65
68 - 72	13	2	9	9	33
- 67	7	-	4	-	11
	617	457	377	223	1674

Table XXXIX

Mean.............................. 99.041

Probable error (mean)........... ±.229

Median............................ 99.397

Probable error (median).......... ±.286

Upper quartile (Q_3).............107.852

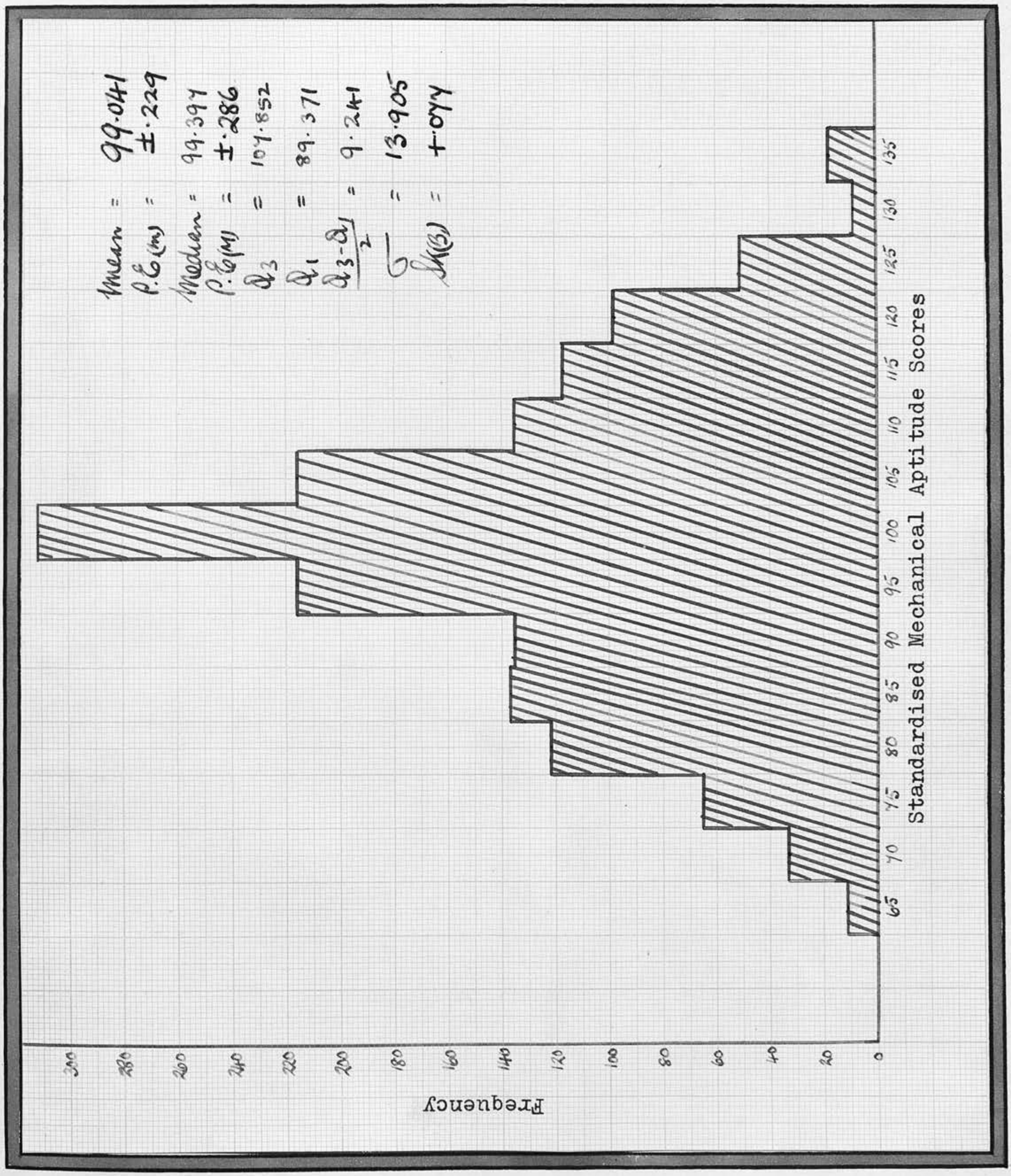
Lower quartile (Q_1)............. 89.371

Semi-interquartile range........ 9.241

Standard deviation.............. 13.905

Skewness (β_1)................... -.077

HISTOGRAM OF DATA CONTAINED IN TABLE



MANUAL DEXTERITY (Raw scores)

Male Group

Table XLI shows the distributions of raw manual dexterity scores for the male group and for the individual school groups, the histogram of the frequency distribution for the male group appearing below the Table. Table XL shows that the raw mean manual dexterity score is 114.372 with a probable error of ±.288 and that the median raw score is 114.616 with a probable error of ±.360. The standard deviation is 13.180 and the distribution is very slightly negatively skew.

The raw manual dexterity score, as has been stated before, is found by adding together the median scores in the three sub-tests which compose the manual dexterity test battery, viz. assembling test, dissembling test and the pegboard test.

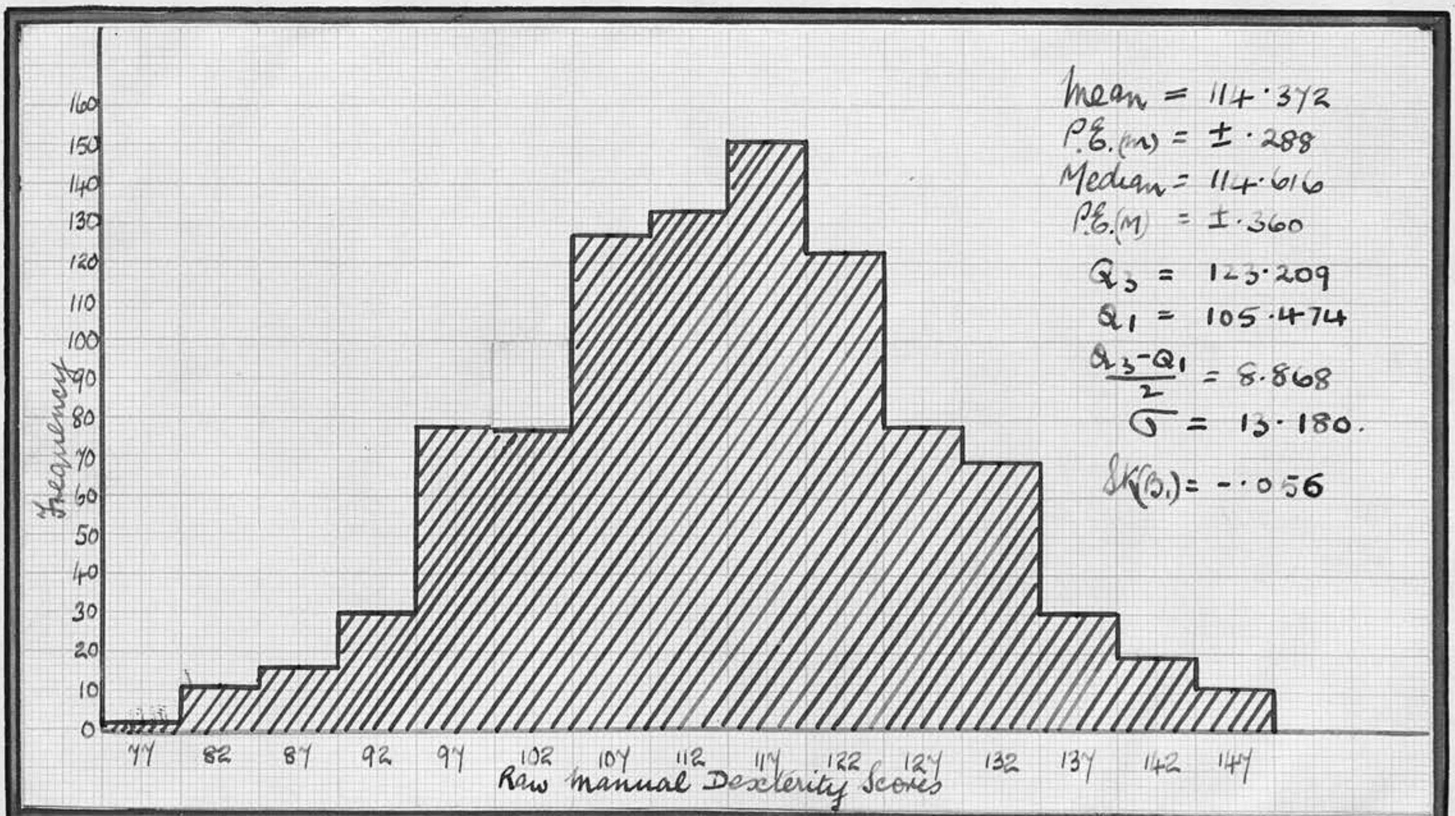
Table XL

Mean........................	114.372
Probable error (mean)........	±.288
Median......................	114.616
Probable error (median)......	±.360
Upper quartile (Q_3)..........	123.209
Lower quartile (Q_1)..........	105.474
Semi-interquartile range.....	8.868
Standard deviation..........	13.180
Skewness (β_1)................	-.056

Note:- The parameters in the above Table refer to the frequency distribution of raw manual dexterity scores for the Total Male Group.

DISTRIBUTION OF MANUAL DEXTERITY RAW SCORES (MALE)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
145 -	6	2	3	-	11
140 - 144	9	6	4	-	19
135 - 139	15	9	6	-	30
130 - 134	31	22	15	1	69
125 - 129	29	24	21	4	78
120 - 124	47	41	28	7	123
115 - 119	53	46	41	11	151
110 - 114	44	33	36	20	133
105 - 109	47	32	19	29	127
100 - 104	14	15	19	29	77
95 - 99	25	19	8	26	78
90 - 94	10	4	2	14	30
85 - 89	5	4	4	3	16
80 - 84	3	1	-	7	11
- 79	-	-	-	2	2
	338	258	206	153	955



Female Group

Table XLIII shows the distributions of raw manual dexterity scores for the female group and for the school groups composing it. The histographic representation of the frequency distribution for the female group appears below Table XLIII. As shown in Table XLII, the mean raw manual dexterity score is 107.867 with a probable error of $\pm.313$ and the median raw score is 107.126 with a probable error of $\pm.391$. The standard deviation for the group is 13.765 and the distribution is positively skew, β_1 having a value of +.161.

Table XLII

Mean..........................	107.867
Probable error (mean)..........	$\pm.313$
Median........................	107.126
Probable error (median)........	$\pm.391$
Upper quartile (Q_3)............	116.287
Lower quartile (Q_1)............	98.917
Semi-interquartile range........	8.685
Skewness (β_1)..................	+.161
Standard deviation.............	13.765

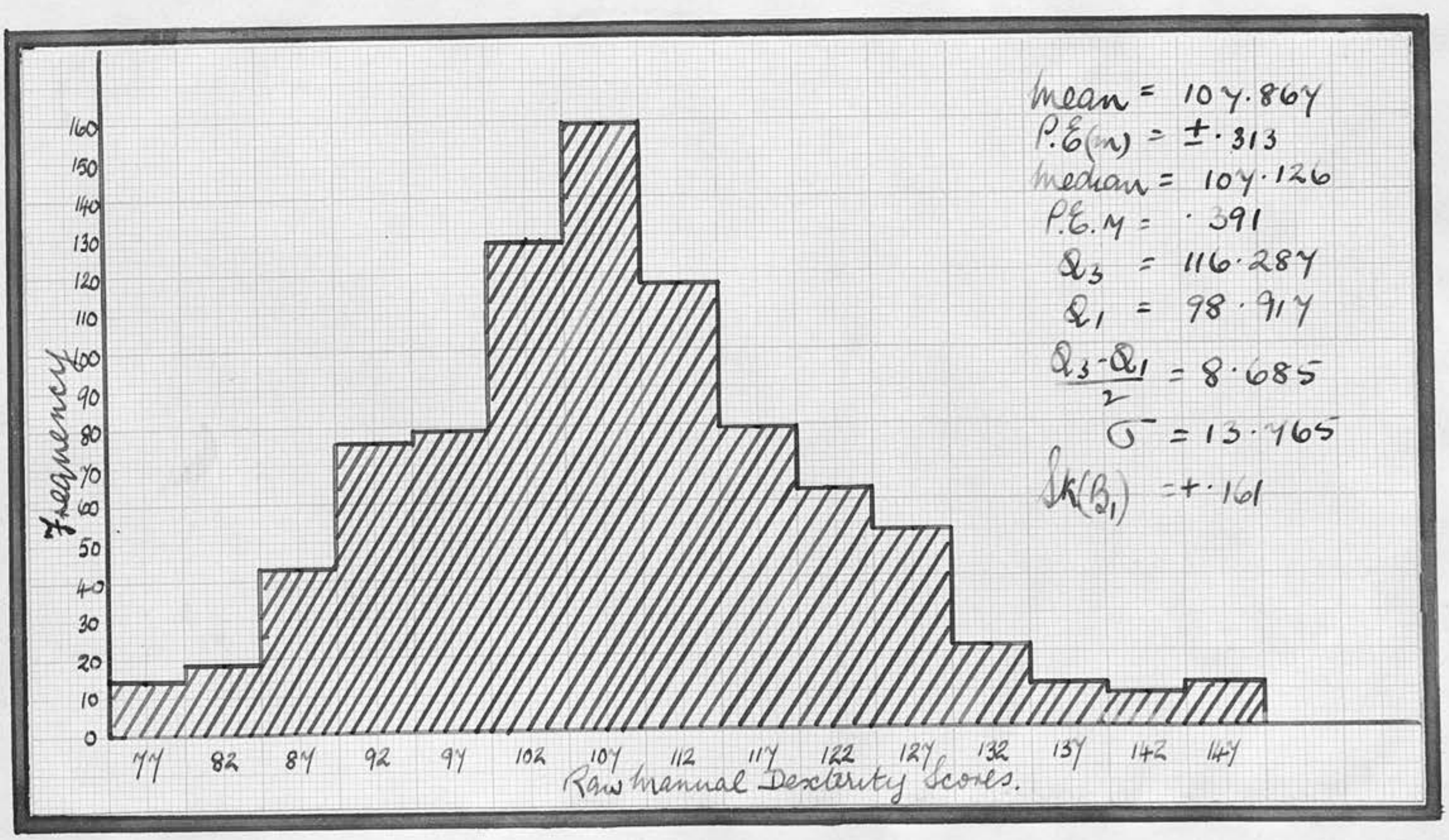
Note:- The parameters in the above Table refer to the frequency distribution of raw manual dexterity scores for the Total Female Group

Sex differences

There is a significant difference between the mean raw manual scores for the male and female groups, necessitating the construction of separate norms for boys and girls. The measures of skewness are also significantly different, the test being more difficult for girls.

DISTRIBUTION OF MANUAL DEXTERITY RAW SCORES (FEMALE)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
145 -	11	1	-	-	12
140 - 144	8	-	1	-	9
135 - 139	4	2	6	-	12
130 - 134	12	6	4	-	22
125 - 129	30	14	7	1	52
120 - 124	36	14	12	1	63
115 - 119	29	20	27	3	79
110 - 114	45	36	30	6	117
105 - 109	57	42	33	27	159
100 - 104	41	41	26	20	128
95 - 99	30	19	18	12	79
90 - 94	24	18	17	17	76
85 - 89	14	9	10	10	43
80 - 84	7	3	4	4	18
- 79	4	2	2	6	14
	352	227	197	107	883



This is due to the fact that in the assembling test the boys obtained, on the average, much higher scores than the girls, a finding to some extent expected, since boys are much more accustomed to handle nuts and bolts.

Total Group - Male and Female

Table XLIV shows the distribution of raw manual dexterity scores for the total group and the corresponding distributions for the individual school groups. The histographic representation of the frequency distribution for the total group is shown on the page following Table XLIV. Table XLV contains the parameters for the total frequency distribution of raw scores. The mean raw score for the group is 111.245 $\pm$.218 and the median raw score is 110.720 $\pm$.273. The standard deviation for the group is 13.845 and β_1 has a value of +.114.

In the construction of norms for this test, a standard deviation of fourteen has been provisionally selected for both boys and girls. The norms are shown on pages 120 - 121 : Appendix A.

DISTRIBUTION OF RAW MANUAL DEXTERITY SCORES

(Male and Female)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
145 -	17	3	3	-	23
140 - 144	17	6	5	-	28
135 - 139	19	11	12	-	42
130 - 134	43	28	19	1	91
125 - 129	59	38	28	5	130
120 - 124	83	55	40	8	186
115 - 119	82	66	68	14	230
110 - 114	89	69	66	26	250
105 - 109	104	74	52	56	286
100 - 104	55	56	45	49	205
95 - 99	55	38	26	38	157
90 - 94	34	22	19	31	106
85 - 89	19	13	14	13	59
80 - 84	10	4	4	11	29
- 79	4	2	2	8	16
	690	485	403	260	1838

Table XLV

Mean........................ 111.245

Probable error (mean)........ ±.218

Median...................... 110.720

Probable error (median)....... ±.273

Upper quartile (Q_3).......... 120.589

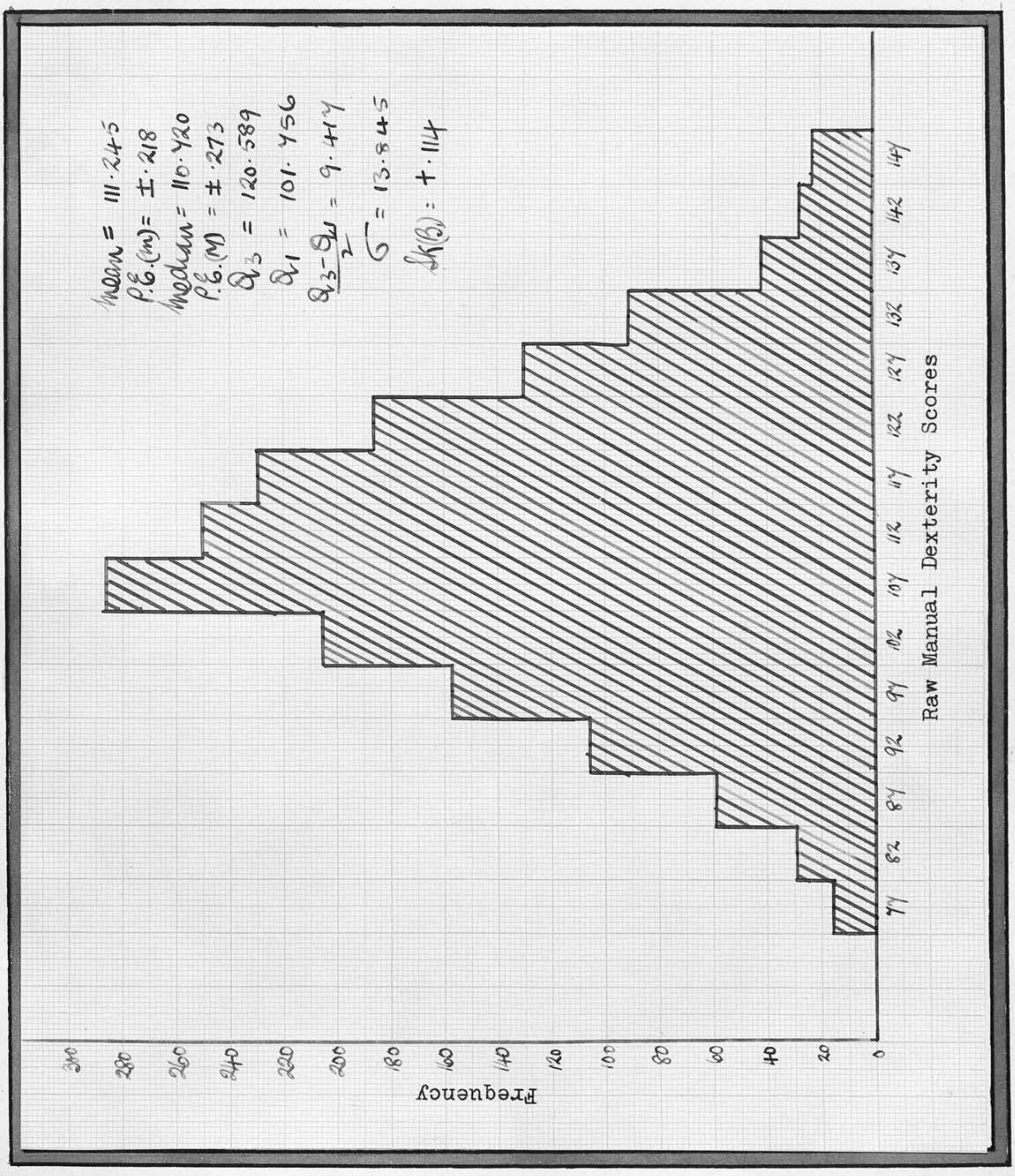
Lower quartile (Q_1).......... 101.756

Semi-interquartile range...... 9.417

Standard deviation........... 13.845

Skewness (β_1)................ +.114

HISTOGRAM OF DATA CONTAINED IN TABLE



MANUAL DEXTERITY (Standardised Scores)

Male Group

Table XLVII shows the frequency distributions of standardised manual dexterity scores for the total male group and for the individual school groups. The histogram of the total frequency distribution appears below Table XLVII. As shown in Table XLVI, the mean standardised score for the total male group is 100.205 ±.280 and the median standardised score is 100.154 ±.360. The standard deviation for the distribution is 13.180 and the measure of skewness is very slightly positive.

Table XLVI

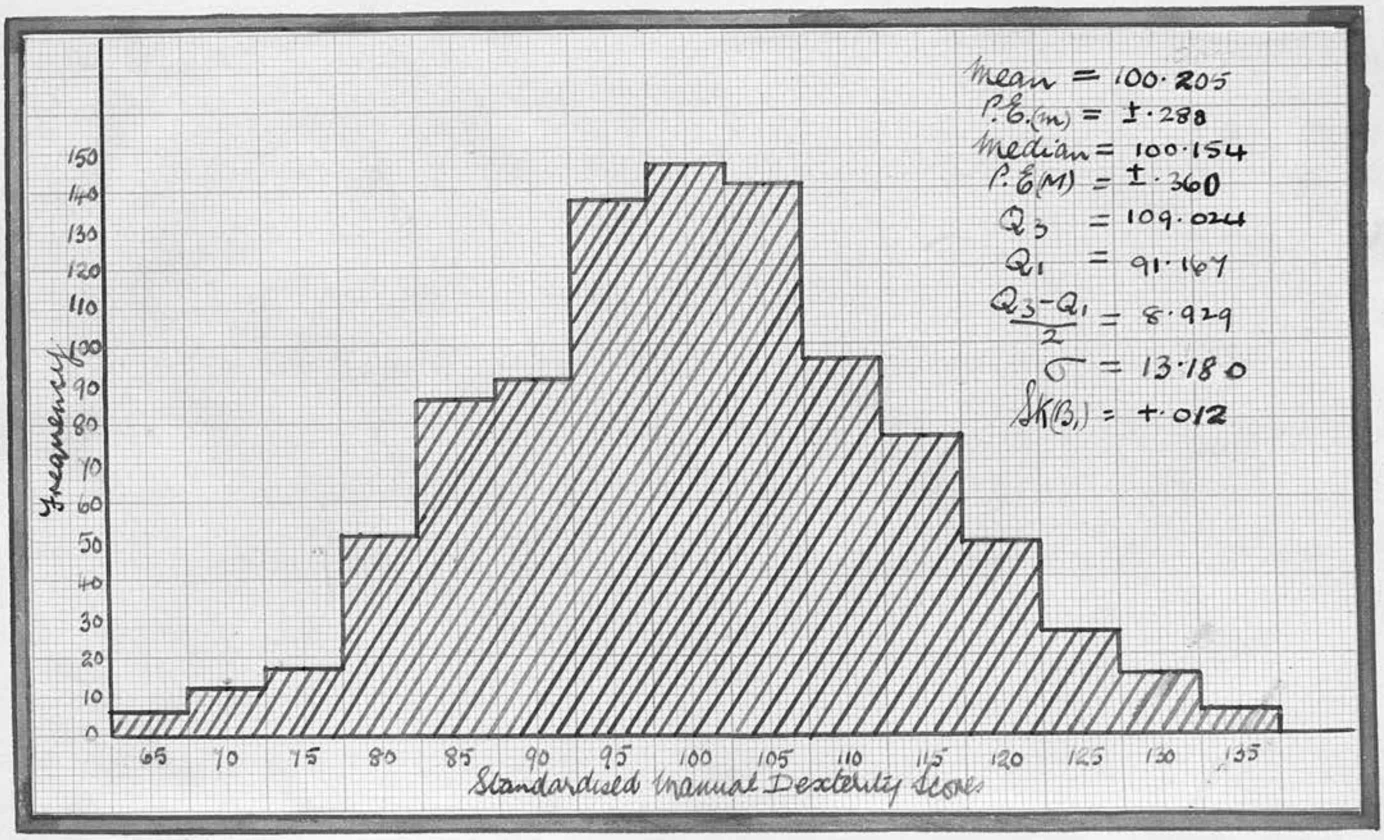
Mean..........................	100.205
Probable error (mean)..........	±.280
Median........................	100.154
Probable error (median)........	±.360
Upper quartile (Q_3)...........	109.024
Lower quartile (Q_1)...........	91.167
Semi-interquartile range.......	8.929
Standard deviation............	13.180
Skewness (β_1)..................	+.012

Note:- The parameters which appear in the above Table refer to the frequency distribution of standardised manual dexterity scores of the Total Male Group.

DISTRIBUTION OF STANDARDISED MANUAL DEXTERITY SCORES

(Male)

Standardised Scores	School T	School B	School J.C.	School D.K.	Total
133 -	3	1	2	-	6
128 - 132	9	4	2	-	15
123 - 127	15	8	3	-	26
118 - 122	19	18	11	1	49
113 - 117	28	30	15	3	76
108 - 112	35	30	25	6	96
103 - 107	51	39	39	12	141
98 - 102	47	44	38	17	146
93 - 97	44	30	31	32	137
88 - 92	26	19	21	25	91
83 - 87	27	24	9	26	86
78 - 82	21	6	4	20	51
73 - 77	7	3	5	2	17
68 - 72	4	2	1	5	12
- 67	2	-	-	4	6
	338	258	206	153	955



Female Group

Table XLIX shows the frequency distribution of standardised manual dexterity scores for the total female and the corresponding distributions for the individual school female groups, the histographic representation of the total frequency appearing below the Table. Table XLVIII shows that the mean standardised score for the group is 99.909 with a probable error of ±.312 and the the median standardised score is 99.497 with a probable error of ±.390. The standard deviation for the group is 13.730 and the distribution is very slightly positively skew, $_1$ having a value of +.090.

Table XLVIII

Mean........................	99.909
Probable error (mean)........	±.312
Median......................	99.497
Probable error (median)......	±.390
Upper quartile (Q_3)..........	103.453
Lower quartile (Q_1)..........	90.762
Semi-interquartile range.....	8.846
Standard deviation..........	13.730
Skewness ($_1$)...............	+.090

Note:- The parameters which appear in the above table refer to the frequency distribution of standardised manual dexterity scores for the Total Female Group

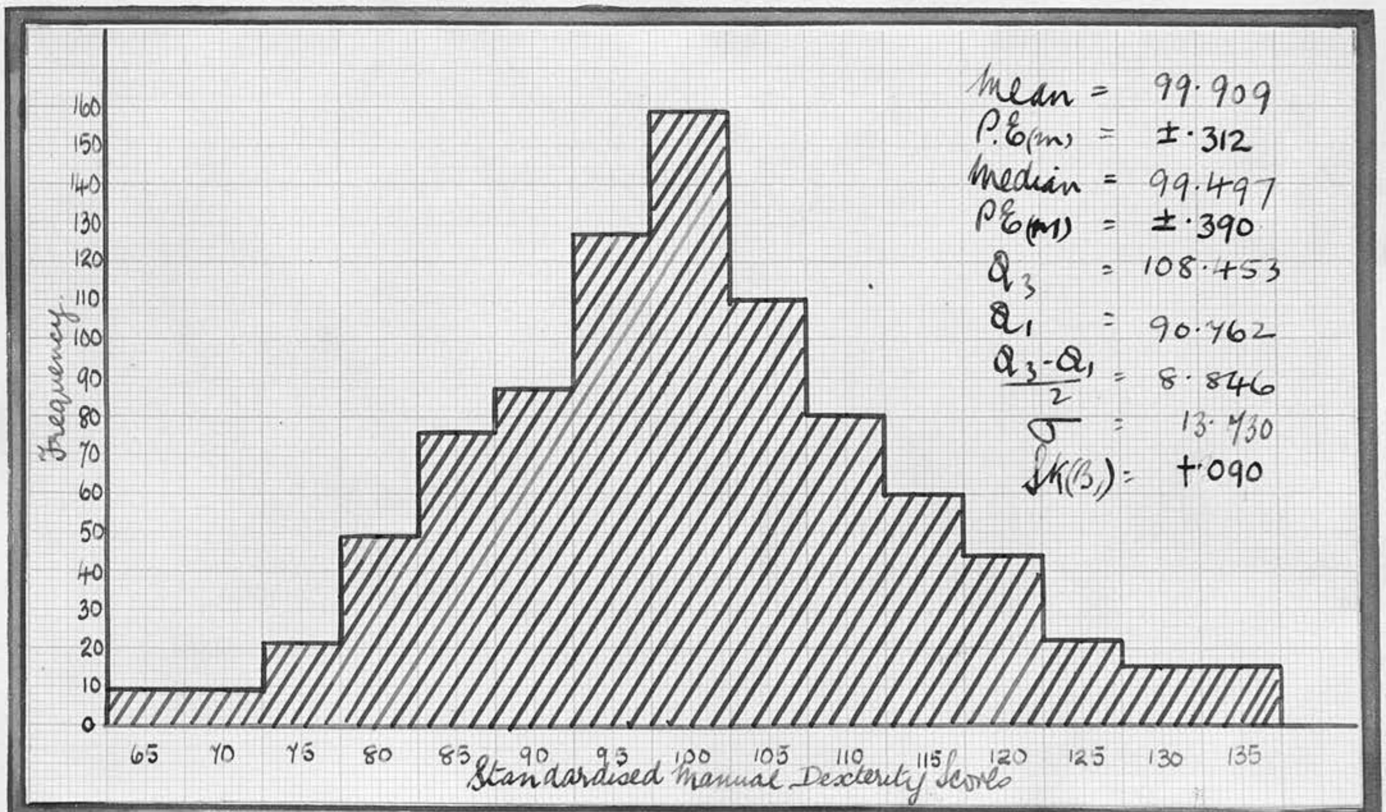
Sex differences

There is no significant difference between the mean standardised

DISTRIBUTION OF STANDARDISED MANUAL DEXTERITY SCORES

(Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	13	1	1	-	15
128 - 132	8	3	4	-	15
123 - 127	10	4	8	-	22
118 - 122	25	12	6	1	44
113 - 117	33	13	13	1	60
108 - 112	29	20	27	4	80
103 - 107	47	32	26	5	110
98 - 102	59	46	32	22	159
93 - 97	40	40	26	21	127
88 - 92	33	21	19	14	87
83 - 87	27	18	15	16	76
78 - 82	15	9	13	12	49
73 - 77	8	4	4	5	21
68 - 72	3	2	1	3	9
- 67	2	2	2	3	9
	352	227	197	107	883



manual dexterity scores of the male and female groups.

Total Group - Male and Female

Table LI shows the frequency distributions of standardised manual dexterity scores for the total group and for the individual total school groups. The histographic representation of the frequency for the total group appears on the page following Table LI. Table LII shows that the mean standardised score for the group is 100.063 $\pm$.212 and that the mean standardised score is 99.812 $\pm$.265. The standard deviation. for the group is 13.445 and the distribution is very slightly positive skew, $_1$ being equal to +.056. Other parameters which pertain to the distribution are shown in Table LII.

The ratings used for the Manual Dexterity Test are shown below in Table L.

RATINGS FOR MANUAL DEXTERITY TEST

Table L

Standardised Scores	Rating
133 -	.... A+
128 - 132	.... A
123 - 127	.... A-
118 - 122	.... B+
113 - 117	.... B
108 - 112	.... B-
103 - 107	.... C+
98 - 102	 C
93 - 97	.... C-
88 - 92	.... D+
83 - 87	.... D
78 - 82	.... D-
73 - 77	.... E+
68 - 72	.... E
- 67	.... E-

DISTRIBUTION OF STANDARDISED MANUAL DEXTERITY SCORES

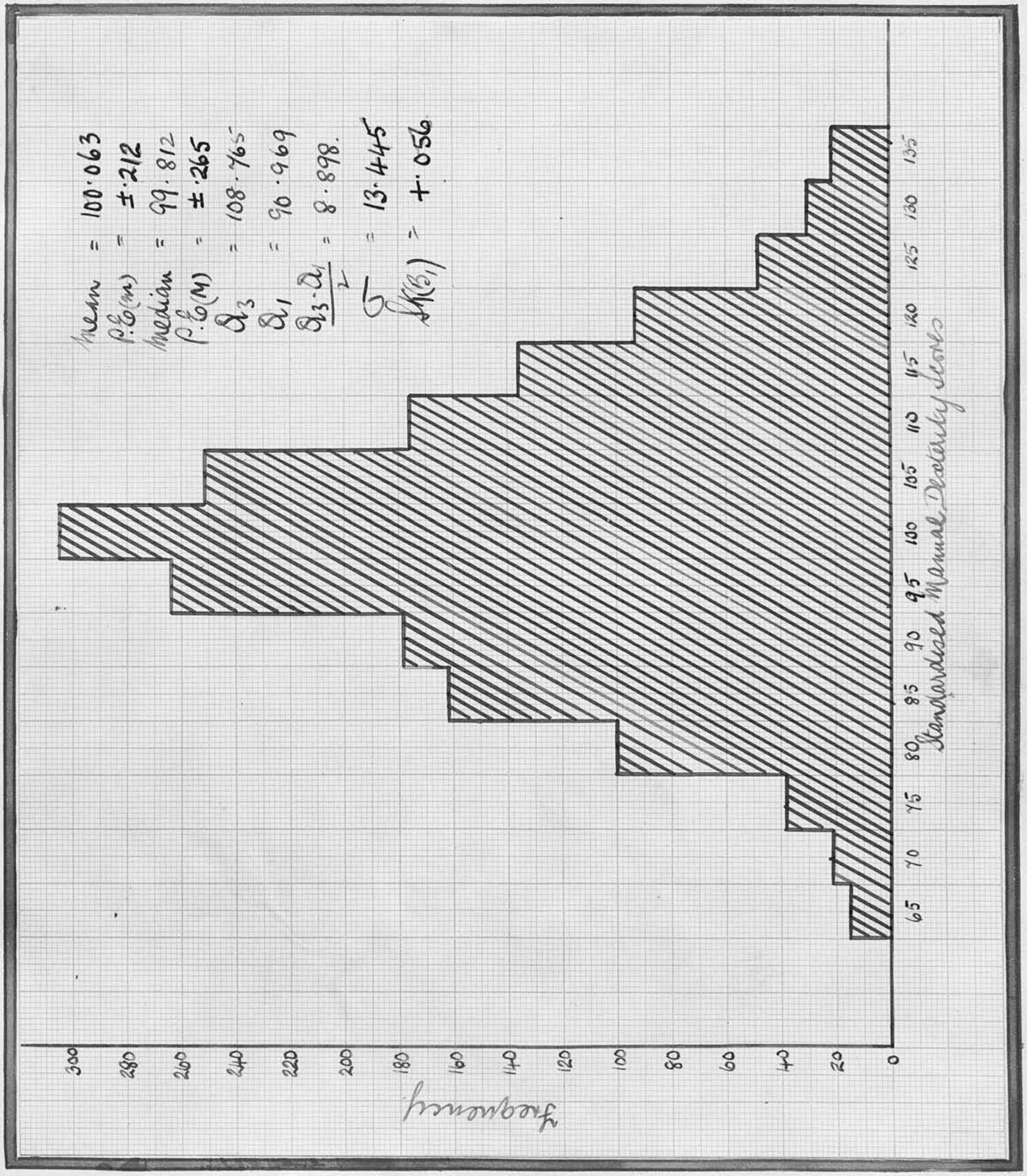
(Male and Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	16	2	3	-	21
128 - 132	17	7	6	-	30
123 - 127	25	12	11	-	48
118 - 122	44	30	17	2	93
113 - 117	61	43	28	4	136
108 - 112	64	50	52	10	176
103 - 107	98	71	65	17	251
98 - 102	106	90	70	39	305
93 - 97	84	70	57	53	264
88 - 92	59	40	40	39	178
83 - 87	54	42	24	42	162
78 - 82	36	15	17	32	100
73 - 77	15	7	9	7	38
68 - 72	7	4	2	8	21
- 67	4	2	2	7	15
	690	485	403	260	1838

Table LII

Mean........................	100.063
Probable error (mean)........	$\pm$.212
Median......................	99.812
Probable error (median)......	$\pm$.265
Upper quartile (Q_3)..........	108.765
Lower quartile (Q_1)..........	90.969
Semi-interquartile range.....	8.898
Standard deviation...........	13.445
Skewness (β_1)...............	+.056

HISTOGRAM OF DATA CONTAINED IN TABLE



ENGLISH TEST (Raw Scores)

Male Group

Table LIV shows the frequency distributions of raw scores in the English Test for the total male group and for the individual school male groups. The histogram for the total frequency distribution appears below Table LIV. Table LIII shows that the mean raw score for the total group is 167.100 with a probable error of ±.866 and that the median raw score is 168.180 with a probable error of ±1.082. The standard deviation for the distribution is 38.580, while the measure of skewness is very slightly negative, β_1 being equal to -.084.

Table LIII

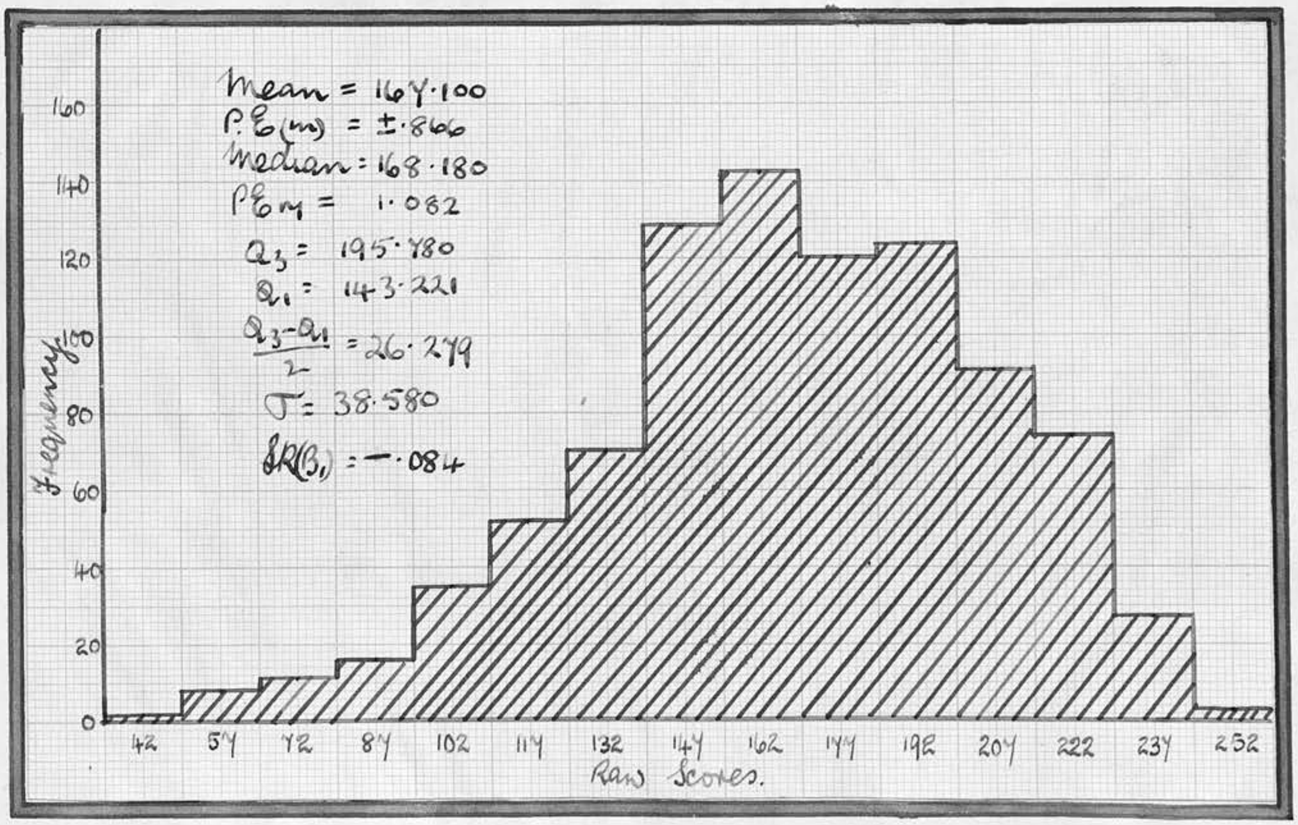
Mean..........................	167.100
Probable error (mean).........	±.866
Median........................	168.180
Probable error (median).......	±1.082
Upper quartile (Q_3)...........	195.780
Lower quartile (Q_1)...........	143.221
Semi-interquartile range......	26.279
Standard deviation............	38.580
Skewness (β_1)................	-.084

Note:- The parameters in the above Table refer to the frequency distribution of raw English scores for the Total Male Group.

DISTRIBUTION OF RAW SCORES FOR ENGLISH TEST

(Male)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
245 -	2	1	-	-	3
230 - 244	11	8	6	2	27
215 - 229	30	27	13	4	74
200 - 214	38	36	15	2	91
185 - 199	44	38	26	16	124
170 - 184	47	33	30	10	120
155 - 169	66	26	34	16	142
140 - 154	36	29	37	26	128
125 - 139	17	18	19	16	70
110 - 124	17	9	14	12	52
95 - 109	9	4	8	14	35
80 - 94	4	5	1	6	16
65 - 79	5	2	1	3	11
50 - 64	4	1	-	3	8
- 49	-	-	-	2	2
	330	237	204	132	903
%	97·6%	91·9%	99·0%	86·3%	94·5%



Female Group

Table LVI shows the frequency distribution of raw scores in the English Test for the total female group and the corresponding distributions for the individual school female groups. The histogram for the total frequency distribution appears below Table LVI. As shown in Table LV, the mean raw score for the total female group is 162.930 with a probable error of ±.854 and the median raw score is 163.926 with a probable error of ±1.067. The standard deviation for the distribution is 36.280 and the measure of skewness is equal to -.082, the distribution being slightly negative.

Table LV

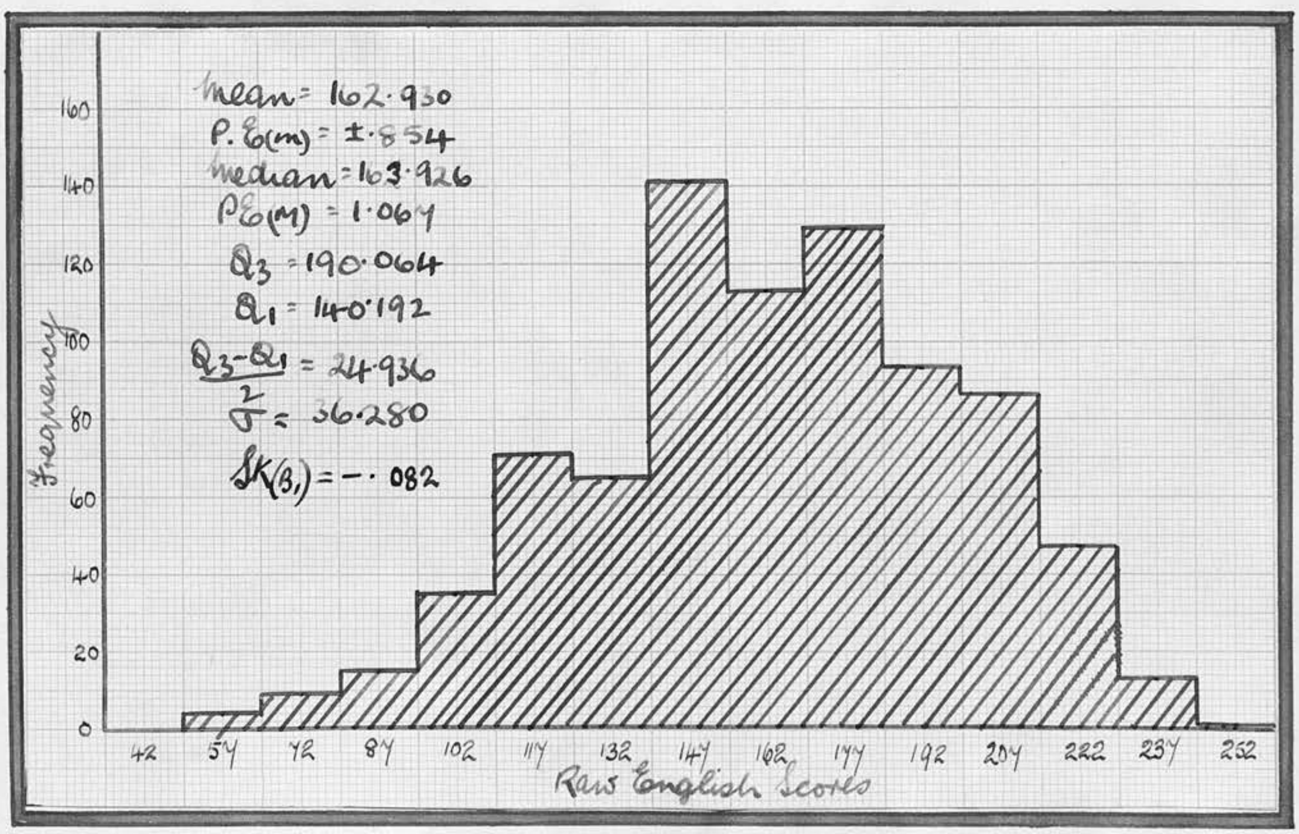
Mean........................	162.930
Probable error (mean).......	±.854
Median......................	163.926
Probable error (median).....	±1.067
Upper quartile (Q_3).........	190.064
Lower quartile (Q_1).........	140.192
Semi-interquartile range....	24.936
Standard deviation..........	36.280
Skewness (β_1)...............	-.082

Note:- The parameters in the above Table refer to the frequency distribution of raw English scores for the Total Female Group.

DISTRIBUTION OF RAW SCORES FOR ENGLISH TEST

(Female)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
245 -	-	1	-	-	1
230 - 244	8	3	1	1	13
215 - 229	19	18	9	1	47
200 - 214	37	32	13	4	86
185 - 199	35	41	14	3	93
170 - 184	53	49	16	11	129
155 - 169	45	29	22	17	113
140 - 154	59	25	43	14	141
125 - 139	23	7	22	13	65
110 - 124	35	4	22	10	71
95 - 109	12	3	9	11	35
80 - 94	3	-	10	2	15
65 - 79	4	-	4	1	9
50 - 64	1	-	1	2	4
- 49	-	-	-	-	-
	334	212	186	90	822
%	94·9%	93·4%	94·4%	84·1%	93·1%



Sex differences

There is no significant difference between the mean raw English scores of the male and female groups.

Total Group - Male and Female

Table LVII shows the frequency distributions of raw scores in the English Test for the total group and for the individual school total groups. The histographic representation of the total frequency distribution appears on the page following Table LVII. As shown in Table LVIII, the mean raw score for the total group is 165.120 ±.610 and the median raw score is 166.270 ±.762. The standard deviation for the group is 37.560 and the distribution is slightly negatively skew. Other parameters pertaining to the total frequency distribution are to be found in Table LVIII.

In the preparation of norms for the English Test, a standard deviation of fifteen has been used. The norms for the English Test are to be found on page 122 : Appendix A.

DISTRIBUTION OF RAW SCORES FOR ENGLISH TEST

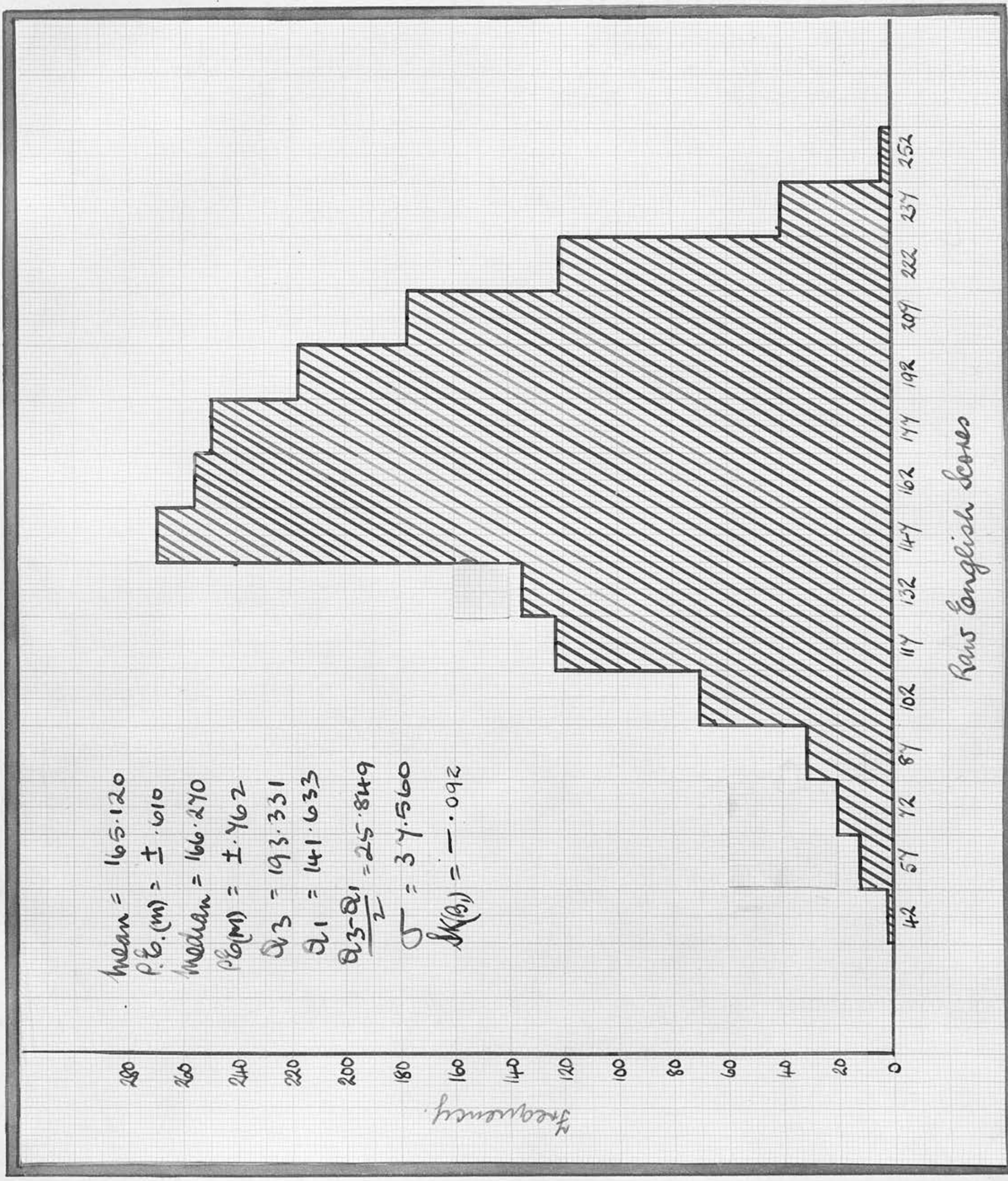
(Male and Female)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
245 -	2	2	-	-	4
230 - 244	19	11	7	3	40
215 - 229	49	45	22	5	121
200 - 214	75	68	28	6	177
185 - 199	79	79	40	19	217
170 - 184	100	82	46	21	249
155 - 169	111	55	56	33	255
140 - 154	95	54	80	40	269
125 - 139	40	25	41	29	135
110 - 124	52	13	36	22	123
95 - 109	21	7	17	25	70
80 - 94	7	5	11	8	31
65 - 79	9	2	5	4	20
50 - 64	5	1	1	5	12
- 49	-	-	-	2	2
	664	449	390	222	1725
%	96·2%	92·6%	96·8%	85·4%	93·8%

Table LVIII

Mean..........................	165.120
Probable error (mean)..........	±.610
Median........................	166.270
Probable error (median)........	±.762
Upper quartile (Q_3)...........	193.331
Lower quartile (Q_1)...........	141.633
Semi-interquartile range.......	25.849
Standard deviation.............	37.560
Skewness (β_1).................	-.092

HISTOGRAM OF DATA CONTAINED IN TABLE



ENGLISH TEST (Standardised Scores)

Male Group

Table LX shows the frequency distribution of standardised English scores for the total male group and the corresponding distributions for the individual school male groups. The histographic representation of the frequency distribution for the total male group is to be found below Table LV. As shown in Table LIX, the mean standardised English score for the group is 101.155 with a probable error of ±.338 and the median standardised score is 100.873 with a probable error of ±.422. The standard deviation is 15.050 and the distribution is very slightly positively skew.

Table LIX

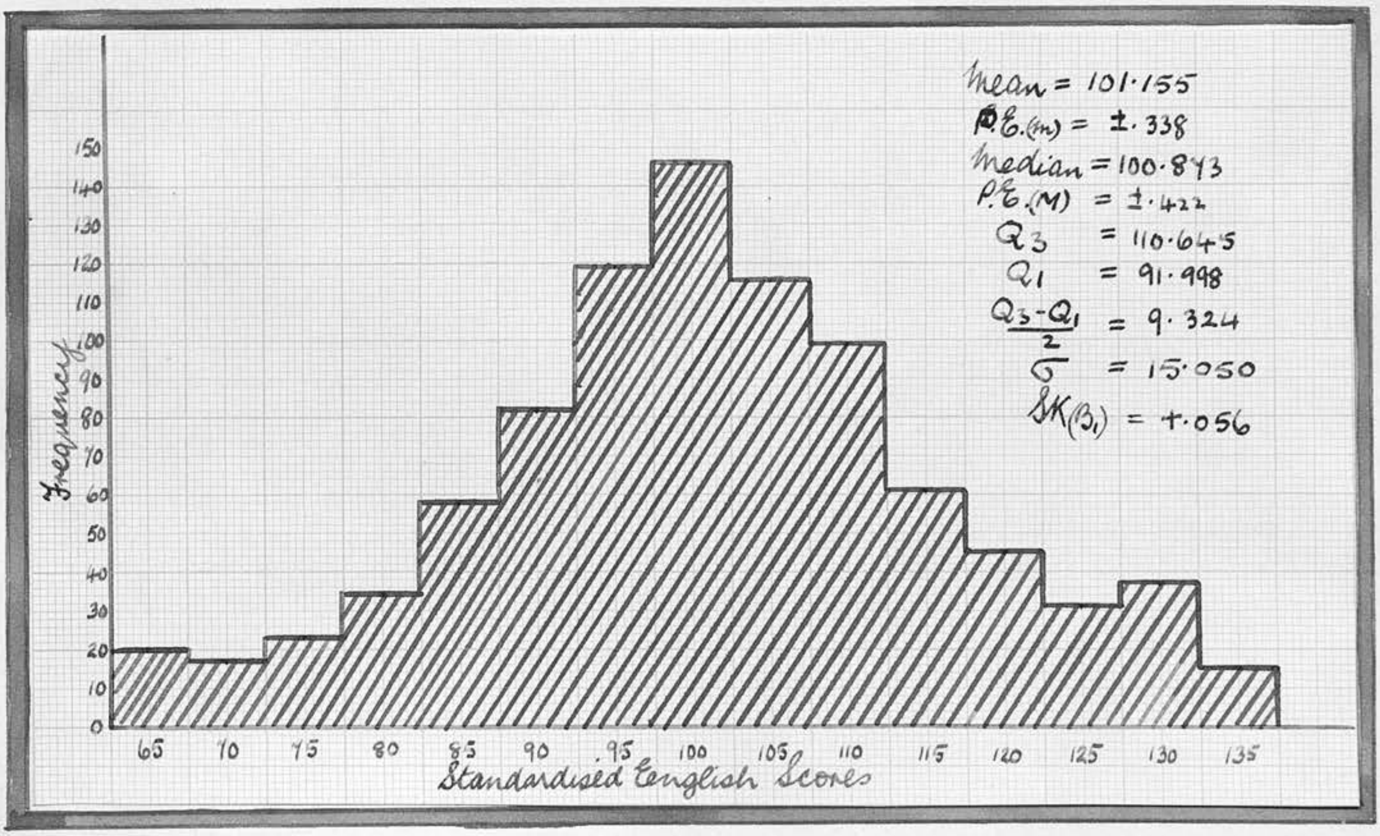
Mean...........................	101.155
Probable error (mean).........	±.338
Median.........................	100.873
Probable error (median).......	±.422
Upper quartile (Q_3)...........	110.645
Lower quartile (Q_1)...........	91.998
Semi-interquartile range......	9.324
Standard deviation............	15.050
Skewness ($_1$).................	+.056

Note:- The parameters in the above Table refer to the frequency distribution of standardised English scores for the Total Male Group.

DISTRIBUTION OF STANDARDISED ENGLISH SCORES

(Male)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	7	4	3	1	15
128 - 132	12	17	8	-	37
123 - 127	14	10	7	-	31
118 - 122	24	12	7	2	45
113 - 117	25	23	11	2	61
108 - 112	31	34	21	13	99
103 - 107	48	33	26	9	116
98 - 102	62	32	35	17	146
93 - 97	45	18	37	19	119
88 - 92	20	28	16	18	82
83 - 87	15	10	18	15	58
78 - 82	8	5	9	12	34
73 - 77	7	3	3	10	23
68 - 72	4	6	2	5	17
- 67	8	2	1	9	20
	330	237	204	132	903



Female Group

Table LXII shows the frequency distributions of standardised English scores for the individual school female groups and the frequency distribution for the total female group (822 individuals), the histographic representation of the latter distribution appearing below the Table. Table LXI shows that the mean standardised English score for the group is 100.190 with a probable error of ±.330 and the median standardised score is 99.885 with a probable error of ±.412. The standard deviation for the group is 14.020 and the distribution is slightly positively skew, β_1 being equal to +.065.

Table LXI

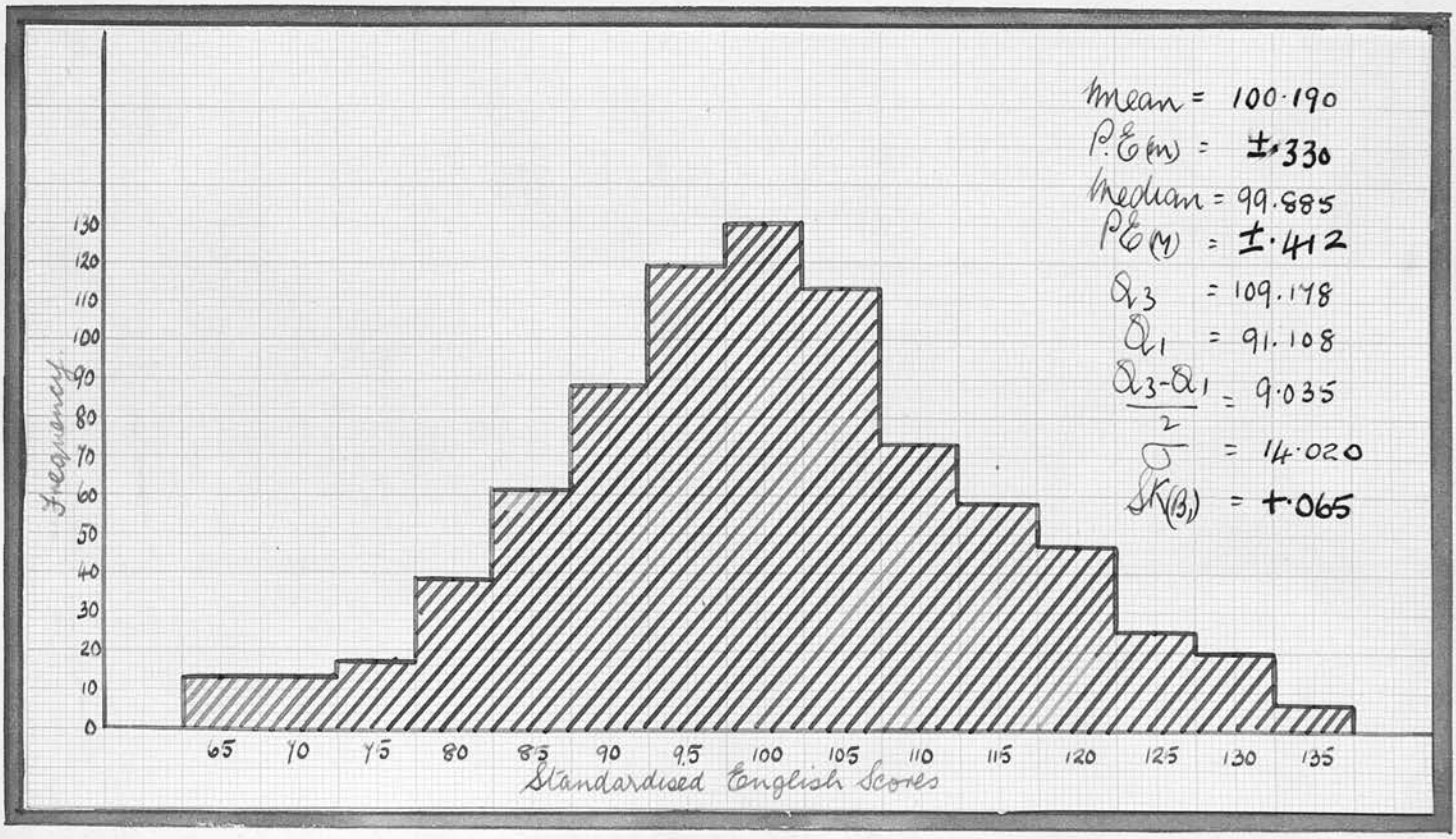
Mean......................	100.190
Probable error (mean)......	±.330
Median....................	99.885
Probable error (median)....	±.412
Upper quartile (Q_3)........	109.178
Lower quartile (Q_1)........	91.108
Semi-interquartile range...	9.035
Standard deviation........	14.020
Skewness (β_1).............	+.065

Note:- The parameters in the above Table refer to the frequency distribution of standardised English scores for the Total Female Group.

DISTRIBUTION OF STANDARDISED ENGLISH SCORES

(Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	7	-	-	-	7
128 - 132	9	6	4	1	20
123 - 127	9	13	3	-	25
118 - 122	19	14	11	3	47
113 - 117	27	22	8	1	58
108 - 112	29	33	8	3	73
103 - 107	53	40	17	3	113
98 - 102	47	43	24	16	130
93 - 97	52	23	29	15	119
88 - 92	35	7	38	8	88
83 - 87	21	7	18	15	61
78 - 82	10	2	12	14	38
73 - 77	6	2	2	7	17
68 - 72	4	-	8	1	13
- 67	6	-	4	3	13
	334	212	186	90	822



Sex differences

There is no significant difference between the mean standardised English scores of the male and female groups.

Total Group - Male and Female

Table LXIV shows the frequency distributions of standardised English scores for the various individual school total groups and the frequency distribution for the total group (1725) individuals), the histographic representation of the latter distribution appearing on the page which follows Table LXIV. Table LXV shows that the mean standardised score for the total group is 100.696 $\pm$.237 and the median score is 100.408 $\pm$.296. The standard deviation for the group is 14.595 and $_{1}$ has a value of +.059. The distribution is, therefore, for all practical purposes symmetrical about the mean. Other parameters pertaining to the total frequency distribution are to be found in Table LXV.

The ratings which were used for the Standardised English Test are shown below in Table LXIII.

RATINGS FOR STANDARDISED ENGLISH TEST

Table LXIII

Standardised Scores	Rating
133 -	A+
128 - 132............	A
123 - 127............	A-
118 - 122............	B+
113 - 117............	B
108 - 112............	B-
103 - 107............	C+
98 - 102............	C
93 - 97............	C-
88 - 92............	D+
83 - 87............	D
78 - 82............	D-
73 - 77............	E+
68 - 72............	E
- 67............	E-

DISTRIBUTION OF STANDARDISED ENGLISH SCORES

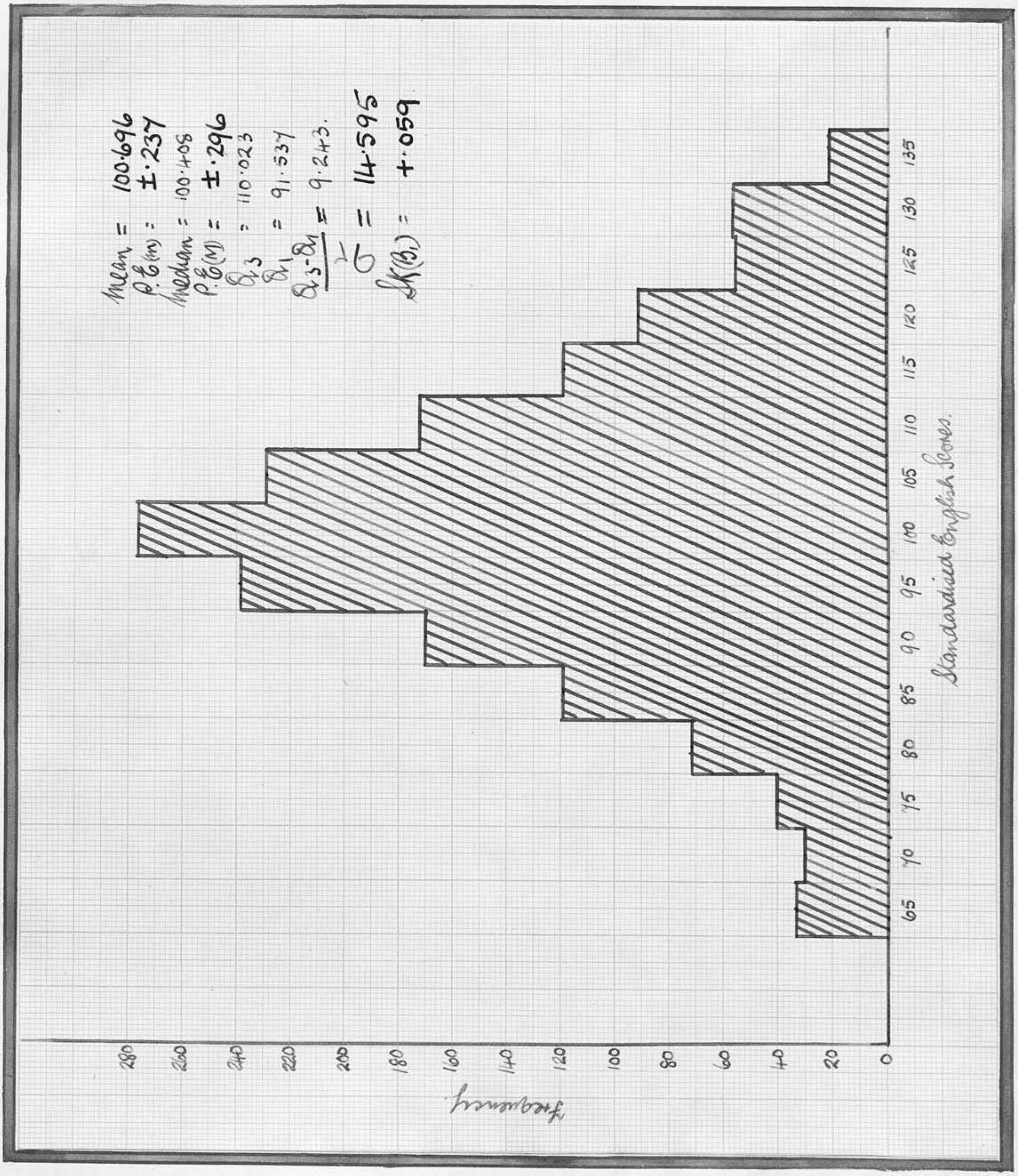
(Male and Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	14	4	3	1	22
128 - 132	21	23	12	1	57
123 - 127	23	23	10	-	56
118 - 122	43	26	18	5	92
113 - 117	52	45	19	3	119
108 - 112	60	67	29	16	172
103 - 107	101	73	43	12	229
98 - 102	109	75	59	33	276
93 - 97	97	41	66	34	238
88 - 92	55	35	54	26	170
83 - 87	36	17	36	30	119
78 - 82	18	7	21	26	72
73 - 77	13	5	5	17	40
68 - 72	8	6	10	6	30
- 67	14	2	5	12	33
	664	449	390	222	1725

Table LXV

Mean............................	100.696
Probable error (mean)............	±.237
Median..........................	100.403
Probable error (median)..........	±.296
Upper quartile (Q_3)..............	110.023
Lower quartile (Q_1)..............	91.537
Semi-interquartile range.........	9.243
Standard deviation...............	14.595
Skewness (β_1)....................	+.059

HISTOGRAM OF DATA CONTAINED IN TABLE



ARITHMETIC TEST (Raw Scores)

Male Group

Table LVII shows the frequency distributions of raw scores in the Arithmetic Test for the various individual school male groups and for the total male group, the histogram for the latter distribution appearing below the Table. Table LVI shows that the mean raw score for the group is 98.700 with a probable error of $\pm$.761 and that the median raw score is 96.971 with a probable error of $\pm$.951. The standard deviation for the group is 34.050 and the distribution is positively skew, β_1 being equal to +.152.

Table LVI

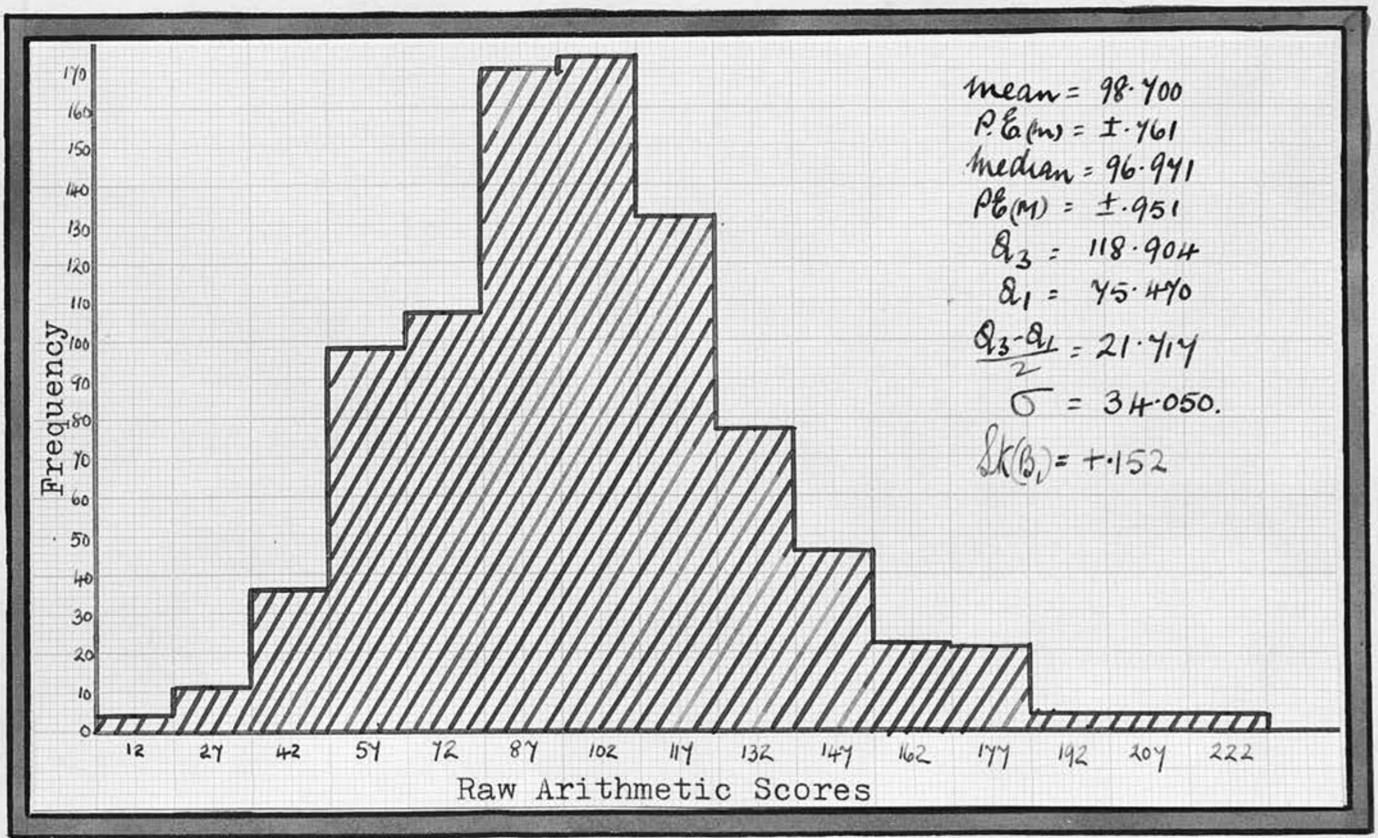
Mean..........................	98.700
Probable error (mean)..........	$\pm$.761
Median........................	96.971
Probable error (median)........	$\pm$.951
Upper quartile (Q_3)............	118.904
Lower quartile (Q_1)............	75.470
Semi-interquartile range........	21.717
Standard deviation..............	34.050
Skewness (β_1)..................	+.152

Note:- The parameters in the above Table refer to the frequency distribution of raw Arithmetic scores for the Total Male Group.

DISTRIBUTION OF RAW SCORES FOR ARITHMETIC TEST

(Male)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
215 -	3	-	-	1	4
200 - 214	1	-	1	2	4
185 - 199	2	1	-	1	4
170 - 184	8	11	2	-	21
155 - 169	12	4	5	1	22
140 - 154	20	7	14	5	46
125 - 139	25	24	17	11	77
110 - 124	41	43	35	13	132
95 - 109	68	42	49	14	173
80 - 94	71	45	37	17	170
65 - 79	36	25	27	19	107
50 - 64	25	31	16	26	98
35 - 49	14	7	2	13	36
20 - 34	3	-	-	8	11
- 19	1	-	1	2	4
	330	240	206	133	909



Female Group

Table LXIX shows the frequency distributions for the various individual school female groups and the total frequency distribution for the female group (830 individuals), the histogram for the latter distribution appearing below Table LXIX. As shown in Table LXVIII, the mean raw score for the group is 107.006 with a probable error of ±.762 and the median raw score is 104.850 with a probable error of ±.953. The standard deviation for the group is 32.565 and the measure of skewness is positive, having a value of +.198.

Table LXVIII

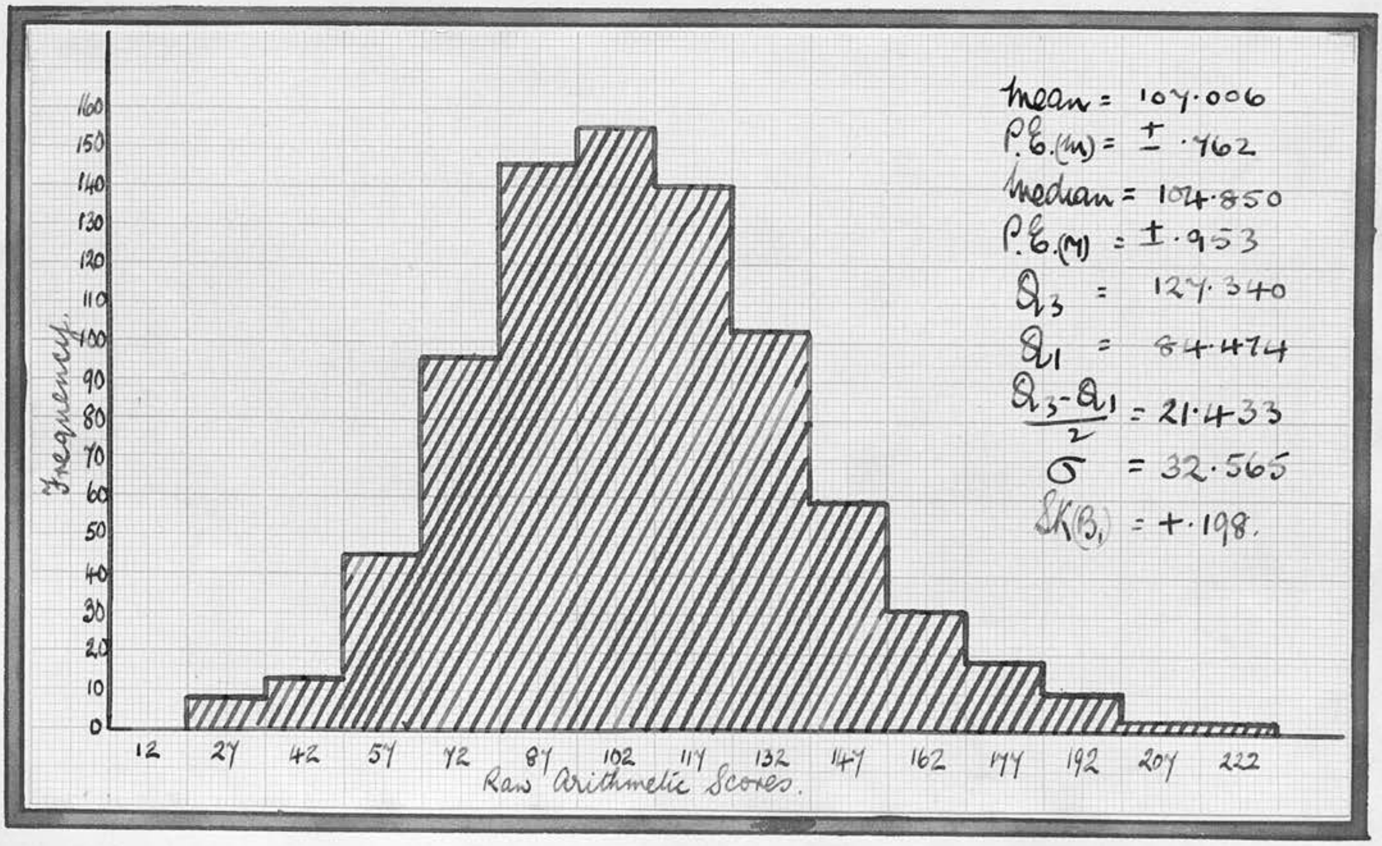
Mean........................	107.006
Probable error (mean)........	±.762
Median......................	104.850
Probable error (median)......	±.953
Upper quartile (Q_3)..........	127.340
Lower quartile (Q_1)..........	84.474
Semi-interquartile range.....	21.433
Standard deviation...........	32.565
Skewness (β_1)................	+.198

Note:- The parameters in the above Table refer to the frequency distribution of raw Arithmetic scores for the Total Female Group.

DISTRIBUTION OF RAW SCORES FOR ARITHMETIC TEST

(Female)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
215 -	3	-	-	-	3
200 - 214	2	1	-	-	3
185 - 199	8	2	-	-	10
170 - 184	8	5	3	2	18
155 - 169	15	12	1	3	31
140 - 154	32	20	7	-	59
125 - 139	45	36	17	5	103
110 - 124	70	42	18	10	140
95 - 109	54	43	39	19	155
80 - 94	49	31	45	21	146
65 - 79	35	13	34	14	96
50 - 64	8	6	18	13	45
35 - 49	5	1	1	6	13
20 - 34	-	1	2	5	8
- 19	-	-	-	-	-
	334	213	185	98	830
%	94·9%	93·8%	93·9%	91·6%	94·0%



Sex differences

There is a significant difference between the mean raw Arithmetic scores of the male and female groups, the significance ratio, $\frac{D}{\sigma_d}$, having a value of 5.198. The girls tested in this scheme would appear to be superior in Arithmetic to the boys of a similar chronological age. This difference can to some extent be explained by the fact that the pupils who are taking Commercial Courses, in which Arithmetic is one of the principal courses, are predominantly members of the female group. In consequence of this fact, therefore, separate norms have not been constructed for both sexes.

In the preparation of norms for the Arithmetic Test a standard deviation of fifteen has been adopted. The norms appear on page 123 : Appendix A.

Total Group - Male and Female

Table LXX shows the frequency distributions of raw Arithmetic scores for the individual school total groups and the frequency distribution for the total group (1739 individuals), the histographic representation of the latter distribution appearing on the page following this Table. Table LXXI shows that the mean raw score for the group is 102.664 with a probable error of $\pm.544$ and that the median raw score is 100.695 with a probable error of $\pm.680$. The standard deviation for the group is 33.600 and the distribution is positively skew, β_1 having a value of +.176. The test therefore shows a tendency of being too difficult for the age group tested. The degree of difficulty, as indicated by the measure of skewness, is however probably due to the length of the test and not to the complexity of the individual constituents in the various sub-tests.

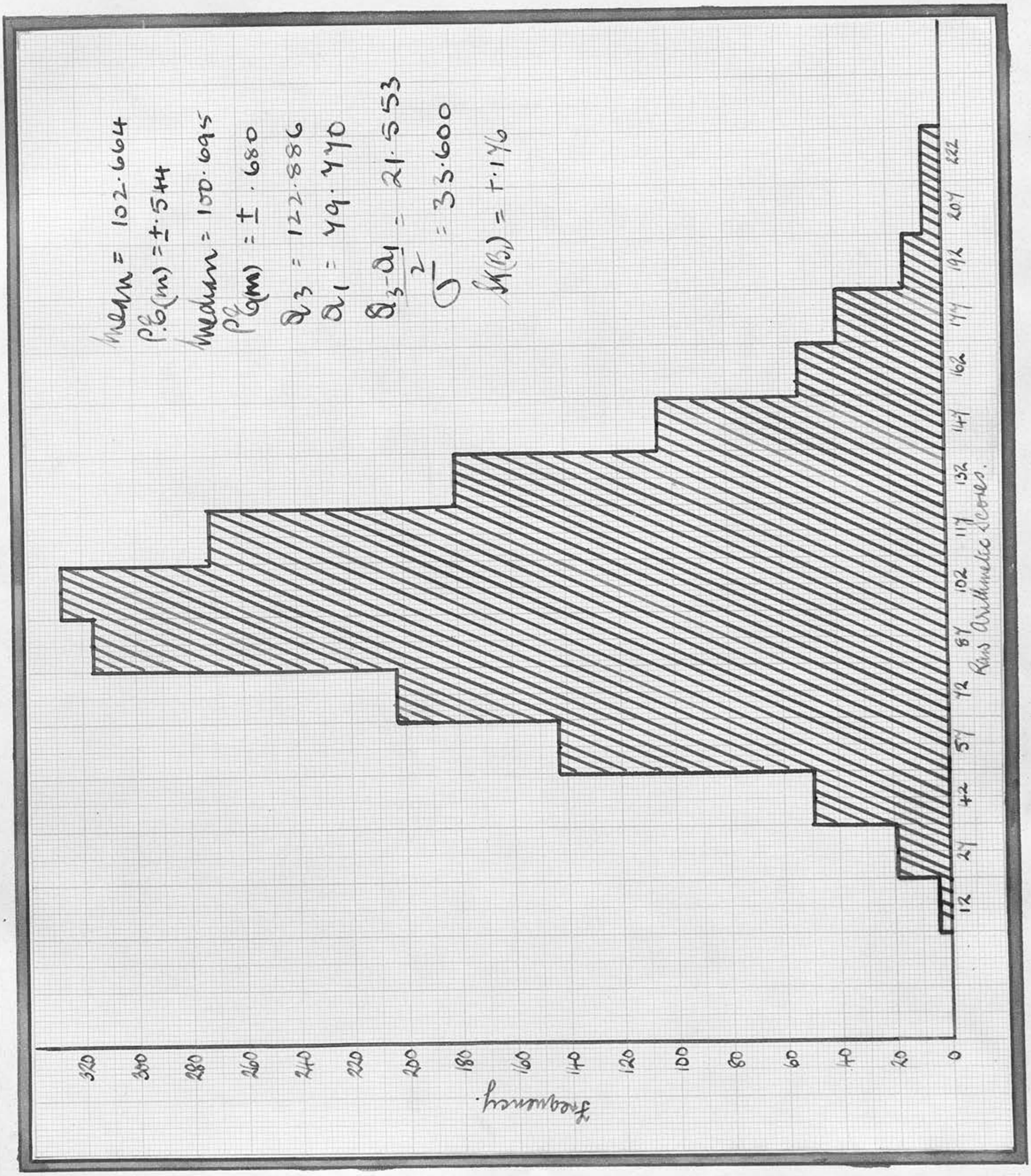
DISTRIBUTION OF RAW SCORES FOR ARITHMETIC TEST (MALE AND FEMALE)

Raw Scores	School				Total
	T	B	J.C.	D.K.	
215 -	6	-	-	1	7
200 - 214	3	1	1	2	7
185 - 199	10	3	-	1	14
170 - 184	16	16	5	2	39
155 - 169	27	16	6	4	53
140 - 154	52	27	21	5	105
125 - 139	70	60	34	16	180
110 - 124	111	85	53	23	272
95 - 109	122	85	88	33	328
80 - 94	120	76	82	38	316
65 - 79	71	38	61	33	203
50 - 64	33	37	34	39	143
35 - 49	19	8	3	19	49
20 - 34	3	1	2	13	19
- 19	1	-	1	2	4
	664	453	391	231	1739
%	96·2%	93·4%	97·0%	88·8%	94·6%

Table LXXI

Mean..............................	102.664
Probable error (mean)...........	±.544
Median..........................	100.695
Probable error (median).........	±.680
Upper quartile (Q_3).............	122.886
Lower quartile (Q_1).............	79.770
Semi-interquartile range.........	21.553
Standard deviation..............	33.600
Skewness (β_1)....................	+.176

HISTOGRAM OF DATA CONTAINED IN TABLE



ARITHMETIC TEST (Standardised Scores)

Male Group

Table LXXIII shows the frequency distributions of standardised Arithmetic scores for the individual school male groups and for the total male group, while the histographic representation of the latter frequency distribution appears below the Table. Table LXXII shows that the mean standardised Arithmetic score for the group is 98.835 with a probable error of ±.332 and that the median standardised score is 98.676 with a probable error of ±.415. The standard deviation for the group is 14.850 and the measure of skewness is equal to +.032.

Table LXXII

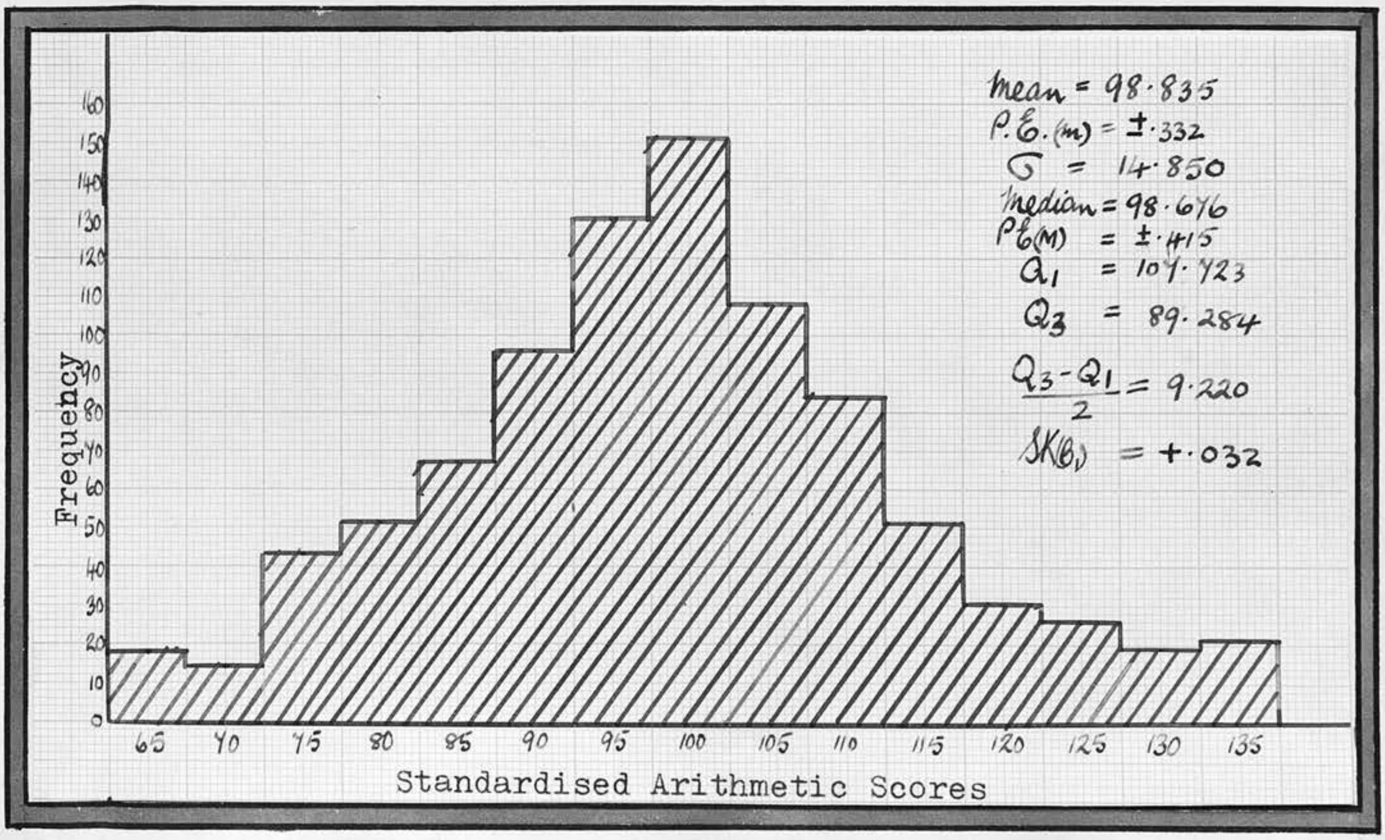
Mean............................	98.835
Probable error (mean)...........	±.332
Median..........................	98.676
Probable error (median).........	±.415
Upper quartile (Q_3).............	107.723
Lower quartile (Q_1).............	89.284
Semi-interquartile range........	9.220
Standard deviation..............	14.850
Skewness (β_1)...................	+.032

Note:- The above parameters refer to the frequency distribution of standardised Arithmetic scores for the Total Male Group.

DISTRIBUTION OF STANDARDISED ARITHMETIC SCORES

(Male)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	9	7	2	3	21
128 - 132	8	7	4	-	19
123 - 127	13	3	9	1	26
118 - 122	16	7	7	-	30
113 - 117	29	7	14	1	51
108 - 112	31	27	19	7	84
103 - 107	31	34	30	13	108
98 - 102	60	36	40	15	151
93 - 97	43	41	29	17	130
88 - 92	29	26	23	18	96
83 - 87	22	20	15	10	67
78 - 82	16	14	6	15	51
73 - 77	11	9	6	17	43
68 - 72	7	2	1	4	14
- 67	5	-	1	12	18
	330	240	206	133	909



Female Group

Table LXXV shows the frequency distributions of standardised Arithmetic scores for the individual school female groups and for the total female group (830 individuals), while the histogram of the latter distribution appears below this Table. Table LXXIV shows that the mean standardised score for the group is 102.229 with a probable error of ±.309 and that the median standardised score is 101.610 with a probable error of ±.386. The standard deviation for the distribution is 13.185 and β_1 has a value of +.141.

Table LXXIV.

Mean..............................	102.229
Probable error (mean)............	±.309
Median............................	101.610
Probable error (median)..........	±.386
Upper quartile (Q_3)..............	110.000
Lower quartile (Q_1)..............	93.662
Semi-interquartile range.........	8.169
Standard deviation...............	13.185
Skewness (β_1)....................	+.141

Note:- The parameters in the above Table refer to the frequency distribution of standardised Arithmetic Scores for the Total Female Group.

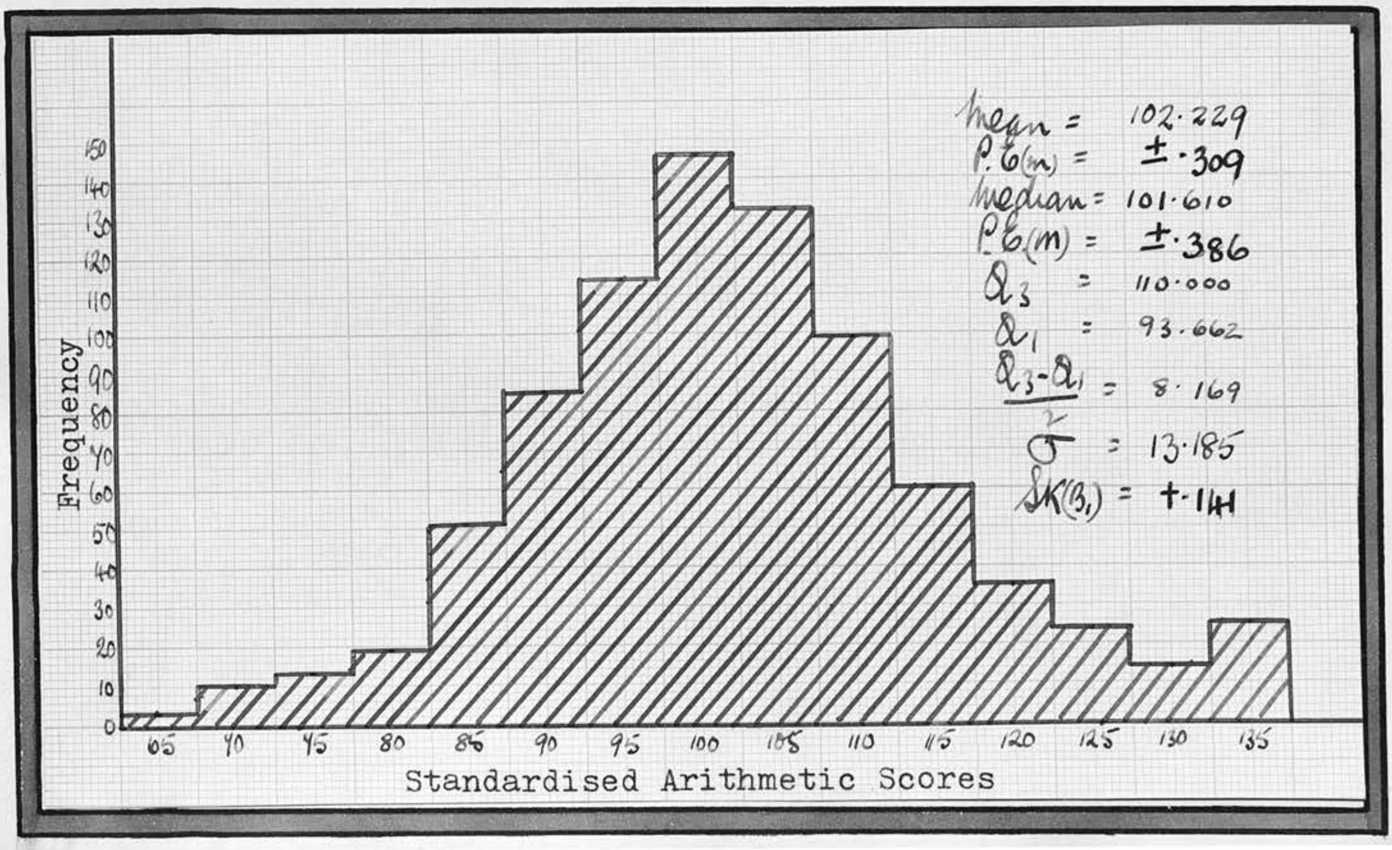
Individual differences

There is a significant difference between the mean standardised Arithmetic scores of the male and female groups, the significance ratio, $\frac{D}{\sigma_d}$, being equal to 5.139. This value is practically identical with

DISTRIBUTION OF STANDARDISED ARITHMETIC SCORES

(Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	18	5	2	-	25
128 - 132	8	5	1	-	14
123 - 127	13	9	1	1	24
118 - 122	17	12	4	2	35
113 - 117	26	18	11	5	60
108 - 112	49	32	12	6	99
103 - 107	51	45	25	11	132
98 - 102	53	35	34	24	146
93 - 97	42	25	32	15	114
88 - 92	30	13	31	11	85
83 - 87	14	8	17	12	51
78 - 82	3	3	9	4	19
73 - 77	6	2	3	2	13
68 - 72	4	-	2	4	10
- 67	-	1	1	1	3
	334	213	185	98	830



the significance ratio found for the raw Arithmetic scores, it had a value of 5.198.

Total Group - Male and Female

Table LXXVII shows the frequency distributions of standardised Arithmetic scores for the various school total groups and for the total group (1739 individuals), while the histographic representation of the latter distribution appears on the page following this Table. Table LXXVIII shows that the mean standardised score for the group is 100.455 ±.229 and that the median standardised score is 100.117 ±.236. The standard deviation for the distribution is 14.180 and β_1 is equal to +.072.

The ratings used for the Standardised Arithmetic Test are shown below in Table LXXVI.

RATINGS FOR STANDARDISED ARITHMETIC TEST

Table LXXVI

Standardised Scores	Rating
133 -	A+
128 - 132	A
123 - 127	A-
118 - 122	B+
113 - 117	B
108 - 112	B-
103 - 107	C+
98 - 102	C
93 - 97	C-
88 - 92	D+
83 - 87	D
78 - 82	D-
73 - 77	E+
68 - 72	E
- 67	E-

DISTRIBUTION OF STANDARDISED ARITHMETIC SCORES

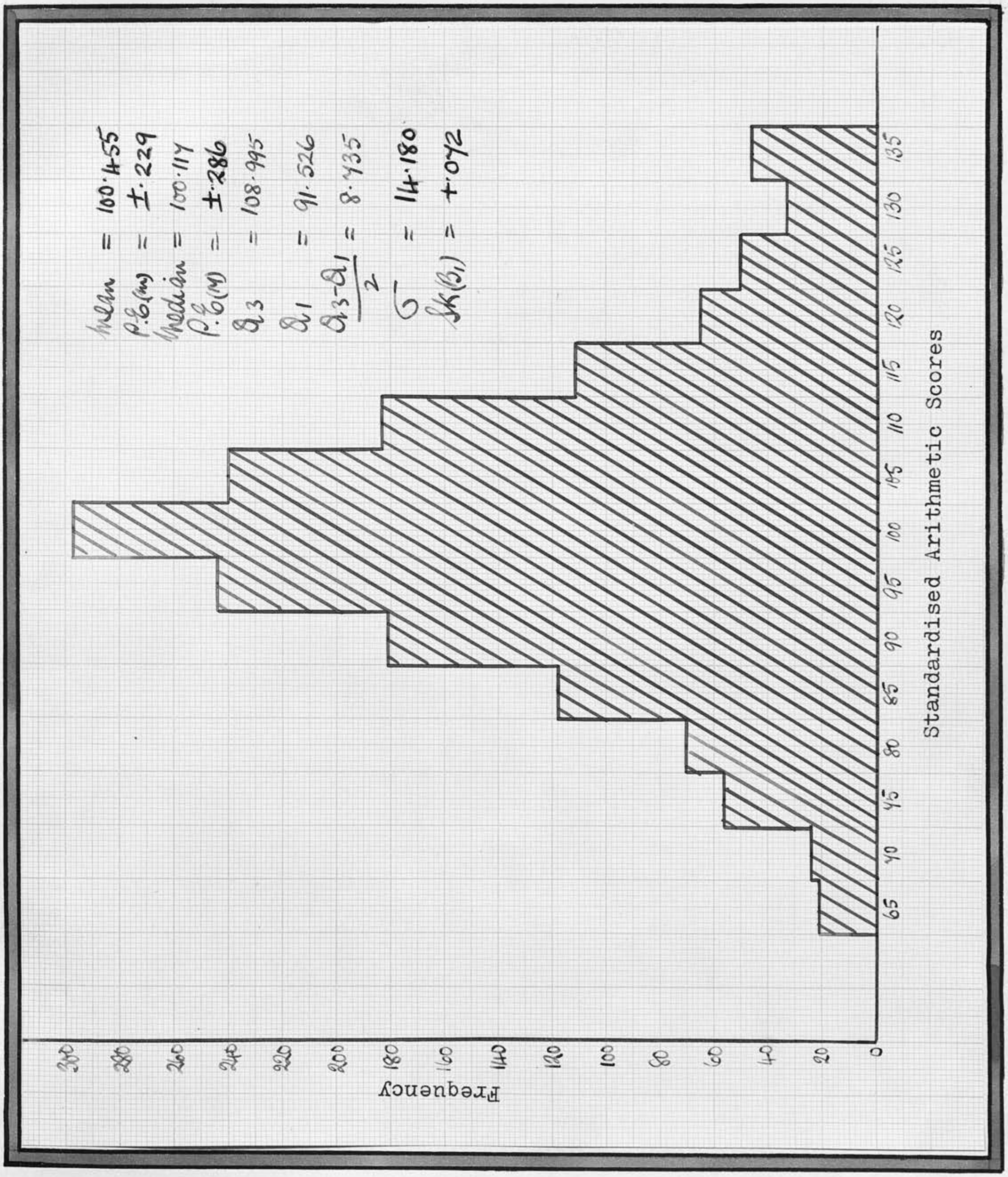
(Male and Female)

Standardised Scores	School				Total
	T	B	J.C.	D.K.	
133 -	27	12	4	3	46
128 - 132	16	12	5	-	33
123 - 127	26	12	10	2	50
118 - 122	33	19	11	2	65
113 - 117	55	25	25	6	111
108 - 112	80	59	31	13	183
103 - 107	82	79	55	24	240
98 - 102	113	71	74	39	297
93 - 97	85	66	61	32	244
88 - 92	59	39	54	29	181
83 - 87	36	28	32	22	118
78 - 82	19	17	15	19	70
73 - 77	17	11	9	19	56
68 - 72	11	2	3	8	24
- 67	5	1	2	14	21
	664	453	391	231	1739

Table LXXVIII

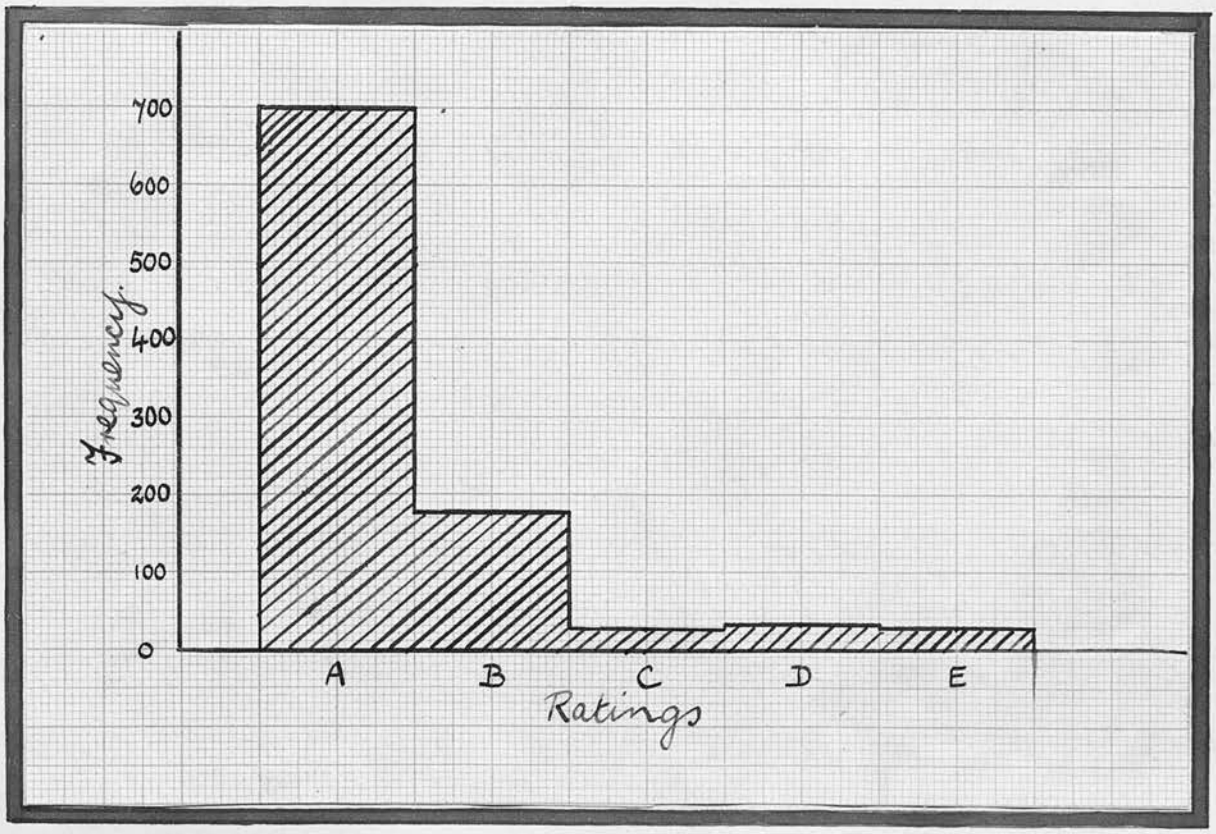
Mean........................	100.455
Probable error (mean)........	±.229
Median......................	100.117
Probable error (median)......	±.286
Upper quartile (Q_3).........	108.995
Lower quartile (Q_1)..........	91.526
Semi-interquartile range.....	8.735
Standard deviation...........	14.180
Skewness (β_1)................	+.072

HISTOGRAM OF DATA CONTAINED IN TABLE



DISTRIBUTION OF RATINGS IN COLOUR BLINDNESS TEST

Rating	T	B	J.C.	D.K.	Total
A	284	183	131	102	700
B	34	47	55	38	174
C	4	8	7	4	23
D	11	9	5	5	30
E	5	11	8	4	28
	338	258	206	153	955
%	100·0%	100·0%	100·0%	100·0%	100·0%



Chapter 9

A STATISTICAL ANALYSIS OF TEST DATA

(B) Correlation Matrices

In this chapter the writer proposes to deal with the coefficients of correlation which exist between the various individual tests composing the present battery. As was pointed out in the previous chapter, he is not concerned, for the present, with the correlation coefficients of the various sub-tests within a specific test. It should also be observed that he has not attempted to make a factorial analysis from the data obtained in this investigation, this will be done at some later date. He has, therefore, confined himself to making a statement of the actual extent to which tests in the battery correlate and to an analysis of the sex differences which have been found for the correlation coefficients of specific tests. In all, forty-five correlation coefficients have been computed, viz. fifteen for the male group, fifteen for the female group and fifteen for the total group (male and female).

Grid I shows the inter-correlations of the following tests:- (a) Linguistic Intelligence Test, (b) Practical Intelligence Test, (c) Mechanical Aptitude Test, (d) Manual Dexterity Test, (e) Standardised English Test and (f) Standardised Arithmetic Test. It should be observed that there is a fair degree of hierarchical order among the correlation coefficients in this Grid. It is not expected, however, after allowance has been made for sampling errors, that the degree of perfection of this hierarchical order will be greatly improved. It may be of interest to note that the writer intends using Thurstone's (1) 'Centre of Gravity Method', in the factorial analysis of the data obtained in this investigation.

Grid I shows the inter-correlations of tests for the male group, Grid II the inter-correlations for the female group, and Grid III the inter-correlations for the total group (male and female). All forty-five correlation coefficients are statistically significant with the exception of 'r' (Manual Dexterity v Mechanical Aptitude) shown in Matrix XXX.

Linguistic Intelligence v English

Matrix I shows that 'r' (Linguistic Intelligence v English) for the male group is .716 $\pm$.011, while Matrix XVII shows that the corresponding 'r' for the female group is .610 $\pm$.015.

Sex difference

There is a significant difference between the above two correlation coefficients, the significance ratio $\frac{D}{P.E._d}$ being equal to 5.699.

Matrix XXXI shows the 'r' (Linguistic Intelligence v English) for the total group is .665 $\pm$.009.

Linguistic Intelligence v Arithmetic

Matrix II shows that 'r' (Linguistic Intelligence v Arithmetic) for the male group is .587 $\pm$.015 and Matrix XVI shows that the corresponding 'r' for the female group is .622 $\pm$.014.

Sex difference

There is no significant difference between the above two coefficients of correlation

Matrix XXXII shows that 'r' (Linguistic Intelligence v Arithmetic) for the total group is .598±.010.

Linguistic Intelligence v Practical Intelligence

Matrix III shows that 'r' (Linguistic Intelligence v Practical Intelligence) for the male group is .335 ±.019, while Matrix XVIII shows that the corresponding 'r' for the female group is .305 ±.021.

Sex difference

There is no significant difference between these coefficients of correlation.

Matrix XXXIII shows that 'r' (Linguistic Intelligence v Practical Intelligence) for the total group is .321 ±.014.

Linguistic Intelligence v Mechanical Aptitude

Matrix IV shows that 'r' (Linguistic Intelligence v Mechanical Aptitude) for the male group is .290 ±.021 and Matrix XX shows that the corresponding 'r' for the female group is .178 ±.023.

Sex difference

There is a significant difference between these coefficients of correlation, the significance ratio being equal to 3.600.

Matrix XXIV shows that 'r' (Linguistic Intelligence v Mechanical Aptitude) for the total group is .237 ±.016.

Linguistic Intelligence v Manual Dexterity

Matrix V shows that 'r' (Linguistic Intelligence v Manual Dexterity) for the male group is .204 ±.022, while Matrix XIX shows the corresponding 'r' for the female group to be .219 ±.022.

Sex difference.

There is no significant difference between these correlation coefficients.

Matrix XXXV shows that 'r' (Linguistic Intelligence v Manual Dexterity) for the total group is .211 ±.016.

English v Arithmetic

Matrix VI shows that 'r' (English v Arithmetic) for the male group is .557 ±.016 and Matrix XXI shows that the corresponding 'r' for the female group is .573 ±.016.

Sex difference.

There is no significant difference between these two coefficients of correlation.

Matrix XXXVI shows that 'r' (English v Arithmetic) for the total group is .567 ±.011.

English v Practical Intelligence

Matrix VII shows that 'r' (English V Practical Intelligence) for the male group is .319 ±.019 while Matrix XXV shows the corresponding 'r' for the female group to be .205 ±.023.

Sex difference

There is a significant difference between these two correlation coefficients, the significance ratio having a value of 3.825.

Matrix XXXVII shows that 'r' (English v Practical Intelligence) for the total group is .267 ±.015

English v Mechanical Aptitude

Matrix VIII shows that 'r' (English v Mechanical Aptitude) for the male group is .268 ±.021, while Matrix XXVII shows the corresponding 'r' for the female group to be .215 ±.023.

Sex difference

There is no significant difference between these two correlation coefficients.

Matrix XXXVIII shows that 'r' (English v Mechanical Aptitude) for the total group is .243 ±.016.

English v Manual Dexterity

Matrix IX shows that 'r' (English v Manual Dexterity) for the male group is .187 ±.022 and Matrix XXVI shows that the corresponding 'r' for the female group is .134 ±.023.

Sex difference.

There is no significant difference between these two coefficients of correlation.

Matrix XXXIX shows that 'r' (English v Manual Dexterity) for the total group is .162 ±.016.

Arithmetic v Practical Intelligence

Matrix X shows that 'r' (Arithmetic v Practical Intelligence) for the male group is .249 ±.021, while Matrix XXII shows the corresponding 'r' for the female group to be .304 ±.021.

Sex difference

There is no significant difference between these two correlation coefficients.

Matrix XL shows that 'r' (Arithmetic v Practical Intelligence) for the total group is .271 ±.015

Arithmetic v Mechanical Aptitude

Matrix XI shows that 'r' (Arithmetic v Mechanical Aptitude) for the male group is .175 ±.022, while Matrix XXIV shows that the corresponding 'r' for the female group is .159 ±.024.

Sex difference

There is no significant difference between these two correlation coefficients.

Matrix XLI shows that 'r' (Arithmetic v Mechanical Aptitude) for the total group is .163 ±.016.

Arithmetic v Manual Dexterity

Matrix XII shows that 'r' (Arithmetic v Manual Dexterity) for the male group is .228 ±.022 and Matrix XXIII shows the corresponding 'r' for the female group to be .221 ±.022.

Sex difference

There is no significant difference between these two coefficients of correlation.

Matrix XLII shows that 'r' (Arithmetic v Manual Dexterity) for the total group is .220 ±.015.

Practical Intelligence v Mechanical Aptitude

Matrix XIII shows that 'r' (Practical Intelligence v Mechanical Aptitude) for the male group is .333 ±.019, while Matrix XXIX shows the corresponding 'r' for the female group to be .218 ±.023.

Sex difference

There is a significant difference between these two coefficients of correlation, the significance ratio being equal to 3.825.

Matrix XLIII shows that 'r' (Practical Intelligence v Mechanical Aptitude) for the total group is .278 ±.015.

Practical Intelligence v Manual Dexterity

Matrix XIV shows that 'r' (Practical Intelligence v Manual Dexterity) for the male group is .202 $\pm$.021 and Matrix XXVIII shows the corresponding 'r' to be .258 $\pm$.021.

Sex difference.

There is no significant difference between these two correlation coefficients.

Matrix XLIV shows the 'r' (Practical Intelligence v Manual Dexterity) for the total group to be .229 $\pm$.015.

Mechanical Aptitude v Manual Dexterity

Matrix XV shows that the 'r' (Mechanical Aptitude v Manual Dexterity) for the male group is .154 $\pm$.022, while Matrix XXX shows the corresponding 'r' for the female group to be .054 $\pm$.024. It will be noted that this latter coefficient of correlation is not statistically significant, i.e. it does not exceed three times its probable error.

Sex difference

There is a significant difference between these two correlation coefficients, the significance ratio being equal to 3.068.

Matrix XLV shows that 'r' (Mechanical Aptitude v Manual Dexterity) for the total group is .105 $\pm$.016.

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GRID I

GRID SHOWING INTER-CORRELATIONS OF TESTS

(Male Group)

	1	2	3	4	5	6
1	-	.716 ±.011	.587 ±.015	.335 ±.019	.290 ±.021	.204 ±.022
2	.716 ±.011	-	.557 ±.016	.319 ±.019	.268 ±.021	.187 ±.022
3	.587 ±.015	.557 ±.016	-	.249 ±.021	.175 ±.022	.228 ±.022
4	.335 ±.019	.319 ±.019	.249 ±.021	-	.333 ±.019	.202 ±.021
5	.290 ±.021	.264 ±.021	.175 ±.022	.333 ±.019	-	.154 ±.022
6	.204 ±.022	.187 ±.022	.228 ±.022	.202 ±.021	.154 ±.022	-

1 = Linguistic Intelligence Test
4 = Practical Intelligence Test
2 = Standardised English Test
3 = Standardised Arithmetic Test
5 = Mechanical Aptitude Test
6 = Manual Dexterity Test

Matrix I

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND ENGLISH

(Male)

English

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+										1			1	4	1	7
A											1			1	2	4
A-									1		2	3	4	4	3	17
B+										9		4	1	6	3	23
B								6	7	12	8	11	8	10	2	64
B-				2	4	3	4	9	15	17	21	7	3	8	1	94
C+	1	1	1	3	3	9	22	25	34	20	12	10	10	3	1	155
C			1	1	9	13	23	40	30	27	11	6	2	1	1	165
C-		1	3	4	11	21	35	40	21	12	4	2	1			155
D+	3	3	5	11	14	21	26	18	4	1	2	2	1		1	112
D	2	5	7	11	11	12	8	6	3							65
D-	8	5	5	2	4	2	1	2	1							30
E+	4		1		1	1										7
E	2	1			1											4
E-		1														1
F	20	17	23	34	58	82	119	146	116	99	61	45	31	37	15	903

Coefficient of correlation = .716

Probable error (r) = ±.011

Matrix II

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND ARITHMETIC

(Male)

Arithmetic

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+								1	2			1	1		2	7
A										1		1	1	1		4
A-									2	4	1	1	4	3	2	17
B+								3	2	6	4	3	2	2	1	23
B					1	1	7	12	9	8	7	6	3	3	7	64
B-				1	3	10	11	19	20	13	8	2	5	1	1	94
C+		1	1	3	7	13	17	29	21	21	13	11	8	5	5	155
C		1	1	11	17	24	36	27	27	9	5	1	2	1	3	165
C-		2	10	11	15	17	30	32	13	6	7	1		1		155
D+	3	4	17	10	11	18	17	16	8	4	2			2		112
D	5	2	8	9	8	10	7	8	4	2	2					65
D-	3	4	4	3	4	3	3	4			2					30
E+	4		1	2												7
E	2		1	1												4
E-	1															1
F	18	14	43	51	66	96	128	151	108	84	51	27	26	19	21	903

Coefficient of correlation = .587

Probable error (r) = $\pm$.015

Matrix III

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND PRACTICAL INTELLIGENCE

(Male)

Practical Intelligence

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+						1					1		2	2	1	7
A										1	1		1		1	4
A-							4	4	2	2	2		1		2	17
B+			1	1		1	1	4	3	3	2	2	3	1	1	23
B	1		1	2	1	2	2	9	9	9	6	10	2	6	4	64
B-	2	2		1	5	7	12	12	12	12	11	9	1	4	4	94
C+	4	1	2	6	6	10	26	29	17	16	14	10	4	6	4	155
C	4	2	7	13	11	16	17	21	21	14	16	7	3	6	7	165
C-	5	3	7	12	25	17	20	19	13	11	7	7	5	1	3	155
D+	3	7	9	9	7	14	14	15	16	6	5	2	1	2	2	112
D	2	3	5	11	10	5	10	4	5	3	2	2	2		1	65
D-	1	4	3	3	2	3	4	5	2	1	2					30
E+	2			1		2	1	1								7
E		1			1			1		1						4
E-										1						1
F	24	23	35	59	68	78	111	124	100	80	69	49	25	28	30	903

Coefficient of correlation = .335

Probable error (r) = $\pm$.019

Matrix IV

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND MECHANICAL APTITUDE

(Male)

Mechanical Aptitude

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+						1			3	2					1	7
A						1				1					2	4
A-	1			1		4	2	2		3	2	2				17
B+					2		4	5	3	3	3		2		1	23
B				2	2	4	2	17	12	4	7	8	4		2	64
B-			2	3	2	7	14	21	13	9	9	9	4	1		94
C+	1	2	7	7	15	9	25	21	22	15	14	11	3	1		153
C		4	4	9	11	12	28	28	24	16	8	12	6		3	165
C-		1	6	9	11	19	19	32	27	12	9	7	1		2	155
D+		5	8	10	7	8	18	24	16	6	5	2	1	1		111
D		1	3	9	5	8	12	12	6	3	1	2	1			63
D-	1	3	2	4	3	2	4	4	3	1	2					29
E+		2	1	1			2									6
E				2	1					1						4
E-			1													
F	3	18	34	57	59	75	130	166	129	76	60	53	22	3	11	896

Coefficient of correlation = .290

Probable error (r) = ±.021

Matrix V

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND MANUAL DEXTERITY

(Male)

Manual Dexterity

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					2			1	2	1		1				7
A							1	1		1		1				4
A-			2		2	3	1	4	2	2			1			17
B+					1	3	1	3	7	3	2		2	1		23
B					1	5	8	17	9	5	10	5	2	1	1	64
B-	1	1	2	1	9	10	18	14	16	6	9	4	1		2	94
C+		1	1	5	11	10	19	20	27	24	19	8	6	3	1	155
C		1	2	4	12	16	26	25	25	18	14	10	7	4	1	165
C-		3	2	11	16	13	22	26	21	12	11	8	5	4	1	155
D+		4	2	7	10	16	19	12	18	9	7	7	1			112
D	2		2	8	8	8	10	8	4	7	3	2	1	2		65
D-	3	1	1	4	3	5	2	4	3	2	1	1				30
E+		1	1	1	1	1	2									7
E			2	1					1							4
E-										1						1
F	6	12	17	42	76	90	129	135	135	91	76	47	26	15	6	903

Coefficient of correlation = .204

Probable error (r) = $\pm$.022

Matrix VI

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND ARITHMETIC

(Male)

Arithmetic

English

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+								1	3		3	3	2	2	1	15
A							3	2	3	5	5	5	7	3	4	37
A-						1	4	6	4	6	1	1	2	3	3	31
B+				2	1	4	4	7	6	7	2	1	2	6	3	45
B					4	6	7	12	11	8	7		2	2	2	61
B-			2	2	6	11	11	19	18	15	4	2	3	1	5	99
C+		1	1	5	7	13	16	18	22	16	6	6	2	1	2	116
C		2	4	7	11	15	29	30	17	9	14	4	2	1	1	146
C-	1	3	6	7	12	18	21	19	11	10	6	3	2			119
D+	3	2	9	6	11	11	14	11	6	5	2	1	1			82
D	2		5	8	3	10	8	12	5	3	1	1				58
D-	1		3	4	6	3	5	9	2				1			34
E+	4	2	4	4		1	4	4								23
E	3	1	4	3	2	2	2									17
E-	4	3	5	3	3	1		1								20
F	18	14	43	51	66	96	128	151	108	84	51	27	26	19	21	903

Coefficient of correlation = .557

Probable error (r) = ±.016

Matrix VII

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND ENGLISH

(Male)

English

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1	2		1	4	8	5	1		1	6	1	30
A			1		3	1	2	2	4	6	1		5	3		28
A-	1			1			1	2	4	6	4	3		2	1	25
B+		1			2	3	6	5	6	6	12	3	1	3	1	49
B	1	1	1		2	7	7	12	11	10	4	6	1	6		69
B-			3	1	5	6	7	13	15	4	7	4	6	6	3	80
C+	3		2	3	3	5	18	18	13	10	6	9	4	3	3	100
C	3	1	4	3	10	13	19	18	9	19	5	7	6	5	2	124
C-	1	4	2	7	9	9	11	22	16	12	9	3	4		2	111
D+	2	3	1	4	3	10	16	17	6	6	3	3	1	2	1	78
D	1	1	1	6	6	10	10	11	7	5	3	4	2		1	68
D-	2	4	1	2	3	7	10	10	9	6	4	1				59
E+	2	1	1	2	3	5	4	6	7	2		1		1		35
E	3	1	3	3	4	2	2	3	1		1					23
E-	1		3	1	3	4	5	3		2	1	1				24
F	20	17	23	34	58	82	119	146	116	99	61	45	31	37	15	903

Coefficient of correlation = .319

Probable error (r) = $\pm$.019

Matrix VIII

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND MECHANICAL APTITUDE

(Male)

English

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+							1	1	1	1	1	1	1	3	1	11
A									1		1			1		3
A-	1				2	1	1	3	4	4	1	1		3	1	22
B+				1	3	4	3	6	10	13	5	2	2	3	1	53
B	2	1	1		2	3	4	8	8	6	5	7	4	6	3	60
B-	2		1	5	5	5	5	13	14	5	7	5	4	2	3	76
C+	2	2	1	2	4	15	19	24	19	20	5	6	3	7		129
C	2	3	8	6	10	15	16	26	25	19	13	11	4	5	3	166
C-	4	1	2	9	11	13	13	20	19	15	9	6	4	3	1	130
D+	1	3	2	1	6	8	18	11	6	4	7	3	1	3	1	75
D	2	1	3	1	3	7	10	14	6	7		1	4			59
D-	3	2	1	6	4	6	9	12	3	4	4		2	1		57
E+		2	2		5	4	10	5			3	2			1	34
E	1	1	2	1	2	1	6	3		1						18
E-		1											2			3
F	20	17	23	32	57	82	115	146	116	99	61	45	31	37	15	896

Coefficient of correlation = .268

Probable error (r) = $\pm$.021

Matrix IX

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND MANUAL DEXTERITY

(Male)

English

Manual Dexterity

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+						1	1		1	1	1	1				6
A				1	2			4	3	2	1	1	1			15
A-					2	1	4	6	3	5	2	1		2		26
B+			1	1	1	7	5	9	7	4	4	3		4	1	47
B		1	1	3	4	7	6	10	15	13	7	5	2	2		76
B-	1	3	1	1	5	8	10	16	13	13	7	3	2	6	2	91
C+	1	1	2	4	5	10	20	25	18	19	6	10	6	5	3	135
C	3	3	3	3	10	10	14	25	15	11	11	12	6	8	1	135
C-	3		4	6	11	14	20	13	23	13	7	3	8	2	2	129
D+	4	3	2	4	12	9	14	9	7	9	6	4	2	4	1	90
D	1	2	3	6	2	7	13	15	4	7	6	2	3	2	3	76
D-	3	3	1	2	3	5	9	8	3	2	2			1		42
E+	2	1	2	2			1	4	2		1		1		1	17
E			2		1	2	1	2	2					1	1	12
E-	2		1	1		1	1									6
F	20	17	23	34	58	82	119	146	116	99	61	45	31	37	15	903

Coefficient of correlation = .187

Probable error (r) = ±.022

Matrix X

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND ARITHMETIC

(Male)

Arithmetic

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				2		3	3	6	5	7	1	1		1	2	31
A	1			1	1	3	1	4	5	3	1	4	1	2	1	28
A-			1			2	2	6	3	5	3	1		1	1	25
B+			2	3	4	4	3	7	11	5	4	5	2			50
B		2		2	7	7	8	13	14	7	3	2	2	1	1	69
B-	3		1	2	2	7	19	12	9	8	6	2	3	2	4	80
C+		1	5	1	10	11	11	25	10	5	4	6	4	4	3	100
C	1	1	7	2	11	9	19	27	15	11	6	4	5	2	4	124
C-	1	3	6	10	6	12	16	19	9	10	8	2	4	4	1	111
D+	1	1	4	6	9	7	19	6	8	9	4	1	4	1		80
D	2	1	5	5	3	15	11	9	6	7	3				1	68
D-	1	2	4	8	9	7	6	9	4	6	3		1		1	61
E+	2	2	5	3	4	2	6	3	3		4			1		35
E	3	1	3	4		2	4	1	3	1	1					23
E-	3			2	1	5	2	4	3			2			2	24
F	18	14	43	51	67	96	130	151	108	84	51	30	26	19	21	909

Coefficient of correlation = .249

Probable error (r) = ±.021

Matrix XI

MATRIX SHOWING CORRELATION BETWEEN ARITHMETIC AND MECHANICAL APTITUDE

(Male)

Arithmetic

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1		1	1		3			2		1	2	11
A		1									1	2				3
A-			1		1	3	1	2	4	4	3	2			1	22
B+		1	3	2	2	5	10	6	10	9	1			1	3	53
B			1	1	7	7	10	8	12	6	1	4		3		60
B-		2	3	5	4	5	10	12	10	11	5	1	3	2	3	76
C+	1		5	14	11	13	17	23	12	11	4	5	7	3	3	129
C	1		10	6	13	19	24	30	22	11	13	5	7	3	2	166
C-	1	4	4	9	6	15	20	28	12	12	11	2	1	3	2	130
D+			4	4	5	10	11	16	4	6	5	3	3	2	2	75
D	3	3	2	3	4	6	11	10	5	9	1	1	1			59
D-	5	1	3	3	9	5	7	9	3	3	4	1	1	1	2	57
E+	4	2	3		3	3	5	3	6	1	1		2		1	34
E	3		2	2	1	2	1	2	4		1					18
E-			1					1					1			3
F	18	14	42	50	66	94	128	150	107	83	51	27	26	19	21	896

Coefficient of correlation = .175

Probable error (r) = ±.022

Matrix XII

MATRIX SHOWING CORRELATION BETWEEN ARITHMETIC AND MANUAL DEXTERITY

(Male)

Arithmetic

Manual Dexterity

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+						1	1		1	1	1		1			6
A					1	1	3	3	3	1		1	1	1		15
A-				1		2	2	6	5	3	3		1	1	2	26
B+		1	1	3	2	3	8	9	7	6	2	2	1	1	1	47
B	1	1	4	1	5	7	10	9	11	15	4	3	3	5	1	80
B-	1	2	1	3	6	12	14	23	9	7	6	1	3	2	1	91
C+	1		2	4	8	12	19	30	25	12	8	7	2	1	4	135
C	2		4	10	11	11	21	25	15	10	9	10	3	4	2	137
C-	2	2	7	11	7	20	21	18	11	14	6	2	6		2	129
D+	4	1	6	10	8	8	12	13	9	5	6	2	2	2	2	90
D	1	2	8	4	7	11	11	10	5	5	4	2	1	1	4	76
D-	1	4	6	1	6	6	4	4	3	4	1				2	42
E+	2		1	1	4	1	2		2	1	1		1	1		17
E	2		2		2	1	2	1	1				1			12
E-	1	1	1	2					1							6
F	18	14	43	51	67	96	130	151	108	84	51	30	26	19	21	909

Coefficient of correlation = .228

Probable error (r) = ±.022

Matrix XIII

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND MECHANICAL APTITUDE

(Male)

Mechanical Aptitude

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					1	1	4	2	4	5	3	7	1		2	30
A						3	4	3	5	1	3	2	2	1	2	26
A-				1	1		3	3	4	6	3	1	3			25
B+			2	2	3	2	7	8	5	4	5	3	2		1	44
B		2	1	1	1	8	9	11	10	6	8	10	3	1	1	72
B-			1	4	6	4	10	13	17	8	10	5	1		2	81
C+			2	5	6	11	12	28	15	12	5	4	3			103
C	2	3	4	4	7	10	16	23	21	12	8	5	3	1	1	120
C-		1	7	11	7	6	23	19	16	6	6	8	2			112
D+		2	5	4	6	11	10	19	8	5	5	2	2			79
D		2	4	6	4	6	8	13	10	4	3	2			2	64
D-			4	9	7	5	9	13	6	3	1	3				60
E+	1	4		2	5	4	5	4	7	2						34
E		3	1	4	4		6	5								23
E-		1	3	4	1	4	4	2	1	2		1				23
F	3	18	34	57	59	75	130	166	129	76	60	53	22	3	11	896

Coefficient of correlation = .333

Probable error (r) = $\pm$.019

Matrix XIV

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND MANUAL DEXTERITY

(Male)

Manual Dexterity

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					1	2	3	5	7	7	1	3	2	1		32
A		1				3	7	7	4	1	2	2	2	1		30
A-					3	2	3	7	4	3	2	1		1		26
B+				3	5	4	5	8	9	3	5	3	3	1	1	50
B		2	1	3	6	9	4	11	13	9	12	2	3			75
B-			1	1	5	14	8	9	13	10	7	7	2	4	1	82
C+				10	8	6	20	13	19	15	10	7	3	1	1	113
C	1		5	6	13	15	15	20	21	14	9	5	3	1	2	130
C-	1	2	2	6	14	8	23	19	12	13	8	3	3	1	1	116
D+	2	1	3	4	10	6	13	12	4	7	6	7	3	3		81
D		1		6	4	2	13	13	15	8	6	1		1		70
D-				5	8	5	11	14	6	3	4	5	1			62
E+	1	1	2	2	2	3	4	2	10	1	3	3	1			35
E		2	2	2	3	3	4	5	1	1						23
E-	1	2	1	3	4	9	4	1	3	2						30
F	6	12	17	51	86	91	137	146	141	96	76	49	26	15	6	955

Coefficient of correlation = .202
Probable error (r) = $\pm$.021

Matrix XV

MATRIX SHOWING CORRELATION BETWEEN MECHANICAL APTITUDE AND MANUAL DEXTERITY

(Male)

Manual Dexterity

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1			1	2	2	1	1	2		1		11
A					1						1	1				3
A-			1		1		4	8	2	3	2	1				22
B+			1	1	5	3	6	8	9	7	6	2	3	1	1	53
B				3	5	6	9	8	9	7	4	3	1	4	1	60
B-	2		2	4	3	8	9	13	11	8	6	5	4	1		76
C+		2		2	14	11	15	18	24	14	13	9	4	2	1	129
C	1	2	5	5	12	19	26	23	24	18	13	9	4	2	3	166
C-		3	2	9	12	12	23	22	15	10	10	8	4			130
D+	1	1	1	5	6	11	11	11	9	8	9	1	1			75
D	2		1	3	3	5	6	7	12	7	5	4	3	1		59
D-		1	3	5	5	9	5	7	8	5	5	2	1	1		57
E+		2		2	8	2	5	5	4	3			1	2		34
E		1		1	1	4	6	2	2		1					18
E-			1	1					1							3
F	6	12	17	42	76	90	126	134	132	91	76	47	26	15	6	896

Coefficient of correlation = .154

Probable error (r) = $\pm$.022

Grid II

GRID SHOWING INTER-CORRELATIONS OF TESTS

(Female Group)

	1	2	3	4	5	6
1	-	.622 ±.014	.610 ±.015	.305 ±.021	.219 ±.022	.178 ±.023
2	.622 ±.014	-	.573 ±.016	.304 ±.021	.221 ±.022	.159 ±.024
3	.610 ±.015	.573 ±.016	-	.205 ±.023	.134 ±.023	.215 ±.023
4	.305 ±.021	.304 ±.021	.205 ±.023	-	.258 ±.021	.218 ±.023
5	.219 ±.022	.221 ±.022	.134 ±.023	.258 ±.021	-	.054 ±.024
6	.178 ±.023	.159 ±.024	.215 ±.023	.218 ±.023	.054 ±.024	-

1 = Linguistic Intelligence Test
2 = Standardised Arithmetic Test
3 = Standardised English Test
4 = Practical Intelligence Test
5 = Manual Dexterity Test
6 = Mechanical Aptitude Test

Matrix XVI

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND ARITHMETIC

(Female)

Arithmetic

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+									1			1		1	2	5
A									2		1				3	6
A-									1	2	1	2	1	2	2	11
B+							1	2	3	8	6	2	4	1	2	29
B						2	1	9	13	8	6	4	5	2	5	55
B-						1	6	19	12	16	18	13	3	2	5	95
C+				1	3	4	14	26	20	23	10	8	6	4	4	123
C			1	3	12	15	20	30	31	23	11	4	4	2	1	157
C-		1	3	2	11	17	30	36	29	14	2	1			1	147
D+	1	5	2	5	11	26	26	15	11	3	2		1			108
D	1		5	3	9	16	13	9	6	2						64
D-	1		1	4	4	4	2									16
E+		2		1	1		1									5
E			1													1
E-																-
F	3	8	13	19	51	85	114	146	129	99	57	35	24	14	25	822

Coefficient of correlation = .622

Probable error (r) = ± .014

Matrix XVII

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND ENGLISH

(Female)

English

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+											1	1		1	2	5
A									1			1		2	2	6
A-										3	1	4	2		1	11
B+						1	3		3	3	7	8	1	3		29
B				2	1	2	3	4	10	5	7	12	5	3	1	55
B-			1	1	3	3	10	15	13	15	8	9	11	5	1	95
C+	1	1		1	3	6	19	25	20	19	16	6	3	3		123
C		3	3	4	14	23	21	29	28	12	10	5	3	2		157
C-	1	2	1	11	11	25	31	22	24	11	6	1		1		147
D+	3		4	11	15	17	21	21	9	5	2					108
D	3	5	3	3	11	11	10	13	5							64
D-	3	2	5	3	1		1	1								16
E+	1			2	2											5
E	1															1
E-																-
F	13	13	17	38	61	88	119	130	113	73	58	47	25	20	7	822

Coefficient of correlation = .610

Probable error (r) = $\pm$.015

Matrix XVIII

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND PRACTICAL INTELLIGENCE

(Female)

Practical Intelligence

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1				1				1	1		1	5
A							1	1	2	2						6
A-					1				1	1	1	3	3	1		11
B+		1		2	1	2	2	6	4	3	2	2		2	2	29
B			2	2	1	3	6	11	13	4	3	2	5	1	2	55
B-	1		2	6	7	5	11	11	9	13	4	9	10	2	5	95
C+	3	1	3	4	11	8	16	19	13	6	11	12	6	7	3	123
C	2	6	3	5	9	16	23	26	18	14	11	11	7	3	3	157
C-	3	3	5	13	15	17	17	17	14	11	15	7	4	6		147
D+	3	8	6	14	11	15	10	12	13	8	3	3		1	1	108
D	3	6	4	5	7	8	7	8	5	6	1	1	2		1	64
D-	1			1	5		2	3	1	1	1		1			16
E+		2	1	1	1											5
E			1													1
E-																-
F	16	27	27	54	69	74	95	115	93	69	52	51	39	23	18	822

Coefficient of correlation = .305

Probable error (r) = ±.021

Matrix XIX

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND MANUAL DEXTERITY

(Female)

Manual Dexterity

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+									1		1	2			1	5
A					1			1	2		1	1				6
A-					1			1	2	2		2	2		1	11
B+			1	2		1	2	9	5	3	3	1	1		1	29
B			1	4	4	1	9	14	6	7	3	2	2		2	55
B-		1		1	14	9	17	14	6	9	11	6	3	4		95
C+	2	1	2	4	7	13	16	18	16	14	11	11	3	1	4	123
C	1	2	2	9	12	16	18	28	23	17	13	7	2	5	2	157
C-	1	2	4	10	18	13	19	26	22	10	7	5	4	4	2	147
D+			6	10	12	13	19	14	12	10	6	4	2			108
D	2	2	1	7	5	11	9	9	4	3	3	3	3	1	1	64
D-	1	1	1			2	2	2	4	2	1					16
E+	1		1	1		2										5
E			1													1
E-																-
F	8	9	20	48	74	81	111	136	103	77	60	44	22	15	14	822

Coefficient of correlation = .219

Probable error (r) = $\pm$.022

Matrix XX

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND MECHANICAL APTITUDE

(Female)

Mechanical Aptitude

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+			1	1				2							1	5
A								1	1	1	2					5
A-				1	1	1	4	1	1			2				11
B+					2	1	3	3	2	2	4	3	3			23
B		1	2	2	5	7	8	10	3	1	6	5	3	1		54
B-		1	6	10	4	9	7	16	7	13	4	6	5	1		89
C+		2	7	6	12	6	11	20	12	10	13	9	4		4	116
C	2	4	5	7	14	9	20	32	20	13	6	8	5	1	2	148
C-	1	1	4	12	13	7	18	34	20	7	9	8	6	3		143
D+		2	5	13	16	12	10	18	11	7	8	2	3			107
D	4		1	10	9	7	3	5	9	4	4	2				58
D-	1	2		3	1	1	1	2	1	1	1					14
E+		1			1		1	1								4
E		1														1
E-																-
F	8	15	31	65	78	60	86	145	87	59	57	45	29	6	7	778

Coefficient of correlation = .178

Probable error (r) = $\pm$.023

Matrix XXI

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND ARITHMETIC

(Female)

Arithmetic

English

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+											2	1			4	7
A								3	5	2	3	3	2	1	1	20
A-								1	5	4	5	4	3	2	1	25
B+						1	2	2	11	7	5	4	5	3	7	47
B					1	2	5	8	7	11	6	5	5	3	5	58
B-					2	1	8	12	15	17	8	6	2		2	73
C+			2	1	2	5	10	18	26	26	5	7	7	1	3	113
C	1	2	3		6	7	18	38	18	18	11	5		3		130
C-	1		1	3	13	20	25	30	14	4	6				2	119
D+		2	2	4	11	20	14	14	13	5	2			1		88
D		2	1	3	4	16	10	12	9	3	1					61
D-		1		2	4	9	11	4	4		3					38
E+	1		1	3	3	2	2	2	1	2						17
E			2	3	1	2	4	1								13
E-		1	1		4		5	1	1							13
F	3	8	13	19	51	85	114	146	129	99	57	35	24	14	25	822

Coefficient of correlation = .573

Probable error (r) = ±.016

Matrix XXII

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND ARITHMETIC

(Female)

Arithmetic

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					1		2	1	4		5	4			1	18
A						2	1	5	3	3	4	3	1		1	23
A-					2	4	3	5	4	9	3	2	1	6		39
B+	1				1	2	4	9	10	9	5	2	2	1	5	51
B				1	1	2	8	5	11	10	5	5	3	1		52
B-		1	2	3	3	8	7	16	5	8	6	4	2	1	3	69
C+			2		2	9	11	19	21	9	10	5	2	2	4	96
C		1		1	11	10	19	15	24	13	7	4	6	1	4	116
C-	1		2	2	4	9	14	22	12	15	6	3	1	1	3	95
D+		3	1	4	4	8	14	15	10	11	3		1	1	1	76
D	1	1	3	4	7	11	11	12	10	5	2		2		2	71
D-		1		3	5	8	6	12	11	3	1	2	1		1	54
E+		1	1		4	4	4	4	3	2	1	1	2			27
E		2	1	1	3	7	5	4	3		1					27
E-			1		3	1	5	2	1	2	1					16
F	3	10	13	19	51	85	114	146	132	99	60	35	24	14	25	830

Coefficient of correlation = .304

Probable error (r) = $\pm$.021

Matrix XXIII

MATRIX SHOWING CORRELATION BETWEEN ARITHMETIC AND MANUAL DEXTERITY

(Female)

Arithmetic

Manual Dexterity	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+						2			3	4	1	1	1	2	1	15
A					1	3	1	1	4	2	2	1				15
A-			1		2		2	4	5	2	1	3			2	22
B+	1				2	3	5	6	7	8	4	3	1	2	2	44
B			1	2	3	1	6	10	14	10	4	3	3	1	2	60
B-		2		1	3	6	14	16	11	10	7	3	2	2	1	78
C+			2	3	4	8	12	15	19	17	6	5	4	2	7	104
C		2	1	1	8	20	21	20	22	18	12	5	1	1	7	139
C-		1	3		6	9	13	31	18	11	7	3	8		1	111
D+	1	1	2	2	8	10	10	16	14	7	5	1	1	2	1	81
D	1	2		1	7	8	14	16	6	6	6	3	2	2		74
D-		1	1	4	2	10	12	6	5	2	3	2	1			49
E+		1	1	3	2	5	2	2	1	2		1			1	21
E			1	1	1			1	3		1	1				9
E-				1	2		2	2			1					8
F	3	10	13	19	51	85	114	146	132	99	60	35	24	14	25	830

Coefficient of correlation = .221

Probable error (r) = ±.022

Matrix XXIV

MATRIX SHOWING CORRELATION BETWEEN ARITHMETIC AND MECHANICAL APTITUDE

(Female)

Mechanical Aptitude

	Arithmetic															
	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+							1	1		2		2	1			7
A								2	3		1					6
A-						1	5	8	5	6	1	1	1		1	29
B+						3	7	10	4	7	6	2	2		4	45
B		1	2		2	4	6	16	9	6	5	5		1		57
B-	1	1			4	5	7	7	12	10	4	4	1		3	59
C+		1	1	2	3	9	12	19	17	9	5	5	3	1		87
C		2	1	6	10	14	20	21	28	17	8	4	5	4	5	145
C-	1	1	1	1	8	8	15	10	15	9	6	2	2	5	2	86
D+				3	2	8	10	12	6	9	2	2		1	5	60
D				1	4	9	12	14	13	9	7	2	5		2	78
D-	1		3	2	10	12	5	8	5	6	7	2	2	2		65
E+			1			5	7	7	2	6		2			1	31
E		1	2		2	2	2	1	5							15
E-				2	4			2								8
F	3	7	11	17	49	80	109	138	124	96	52	33	22	14	23	778

Coefficient of correlation = .159

Probable error (r) = $\pm$.024

Matrix XXV

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND ENGLISH

(Female)

English

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+		1			1	1	1	1	2	4		3	2		2	18
A				1		1	3	4	6	3	2	2			1	23
A-	2		1		2	1	6	3	6	4	6	2	3	3		39
B+		3	2	3	3	5	2	4	10	6	4	4	3	2		51
B		1		4	3	3	4	7	10	10	4	3	3			52
B-		1	3	3	5	5	7	11	10	4	9	4	2	4	1	69
C+		1		4	6	5	21	19	10	6	7	9	2	2	1	93
C	3	1	5	4	9	14	15	15	15	13	7	7	5	1	1	115
C-	3	1		4	5	13	16	21	11	7	5	4	1	3	1	95
D+		1		3	7	11	14	10	12	2	6	4	2	2		74
D	1	1	4	3	5	11	13	14	7	7	2	1				69
D-	1	1	1	5	7	9	8	5	8	2	4	2	1			54
E+	1		1	1	2	4	3	5	4	3		1		2		27
E	1			2	4	4	4	7	2	1			1	1		27
E-	1	1		1	2	1	2	4		1	2	1				16
F	13	13	17	38	61	88	119	130	113	73	58	47	25	20	7	822

Coefficient of correlation = .205

Probable error (r) = ± .023

Matrix XXVI

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND MANUAL DEXTERITY

(Female)

English

Manual Dexterity

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					1	1	1	1	2	2	2	1		1	2	14
A				2	1		1	5	1	3	2					15
A-						2	4	2	8	4		1	1			22
B+			2			6	6	6	8	9	4	1		1	1	44
B	2	1	2	2	1	6	5	10	10	9	6	3	2	1		60
B-	2	2		6	8	8	13	11	11	5	4	3	2	2		77
C+	3		2	3	3	14	12	16	16	10	8	8	5	2	1	103
C		2	3	8	11	9	14	20	26	13	12	11	3	3	1	136
C-	2	2	2	2	10	11	22	23	10	7	10	6	2	2		111
D+	1			4	13	12	11	13	9	5	3	4	4	2		81
D	2	2	1	4	7	7	15	12	6	2	3	4	4	5		74
D-		1	1	4	3	8	12	7	3	1	1	5	1		1	48
E+	1	1	2		2	4	3		2	1	3				1	20
E		1	1	1				3	1				1	1		9
E-		1	1	2	1			1		2						8
F	13	13	17	38	61	88	119	130	113	73	58	47	25	20	7	822

Coefficient of correlation = .134

Probable error (r) = $\pm$.023

Matrix XXVII

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND MECHANICAL APTITUDE

(Female)

English

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+							1	1	2		1			1	1	7
A						2			2	2						6
A-	1		2			1	3	3	5	4	4	5	1			29
B+				2	4	5	3	6	5	8	1	5	3	2	1	45
B				7	4	4	7	13	9	5	1	2	2	3		57
B-		1	1	4	3	3	8	9	9	6	5	4	4	1	1	59
C+			1		7	6	12	21	15	11	4	3	6	1		87
C		2	1	6	15	13	24	21	21	11	16	6	5	4		145
C-		1	2	1	5	13	12	11	12	10	8	6	1	3	1	86
D+	1	2	2	1	5	5	10	13	7	7	3	3	1			60
D	2	2	2	7	5	13	12	11	7	3	5	5	2	2		78
D-	3	2	4	6	4	12	9	8	5	3	2	5		2		65
E+	2		1	2	2	2	4	5	5	1	4	2			1	31
E	2	1			1	4	2		3	1		1				15
E-		1		1	1	2	3									8
F	11	12	16	37	56	85	110	122	107	72	54	47	25	19	5	778

Coefficient of correlation = .215

Probable error (r) = $\pm$.023

Matrix XXVIII

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND MANUAL DEXTERITY

(Female)

ManualDexterity

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1	2	2	1	3	3	2		3	1		1	19
A	1			1		2	5	1	5	2	1	2	1	1	1	23
A-					4	1	7	5	4	7	4	4	3			39
B+	1		1	3	4	2	7	13	2	6	5	2	3	1	4	54
B				1	2	8	5	8	8	6	5	3	4	2	2	54
B-				3	6	7	14	11	6	8	6	7		2	1	71
C+				7	9	7	15	21	15	11	7	5		4	2	103
C	2		4	6	6	12	13	32	25	11	9	8	3	2	1	134
C-	1	1	2	7	14	7	18	12	17	7	8	5	1	2	1	103
D+		1	2	4	10	14	14	20	6	5	4	1		1	1	83
D		2	1	6	8	8	8	12	8	10	6	1	1		1	72
D-	1	2	6	2	3	7	9	11	4	3	5	3	2			58
E+		1	3	2	5	5	2	5	2				2			27
E	2	2	1	3	3	3	6	2	2	2			1			27
E-	1		1	3		2	3	3	3							16
F	9	9	21	49	76	87	127	159	110	80	60	44	22	15	15	883

Coefficient of correlation = .258

Probable error (r) = $\pm$.021

Matrix XXIX

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND MECHANICAL APTITUDE

(Female)

Mechanical Aptitude

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					1	2	1	6					3	1	1	15
A			1	1	1	1		1	4	1	6	2	4			22
A-			1	2		3	7	7	5	4	5	1	1		1	37
B+		1	1	5	3	6	6	11	1	4	3	4	3		2	50
B		1	1	2	4	2	3	6	10	4	7	4	1	2	1	48
B-	1	1	1	5	4	5	4	12	7	5	2	8	4	2		61
C+	1	2	6	11	10	4	6	16	11	7	8	3	1			86
C	1	3	6	3	12	12	12	26	12	7	8	5	5		2	114
C-	2	2	1	7	13	4	11	12	10	10	6	7	4			89
D+		1	3	6	11	5	10	10	8	6	6	4	1	1		72
D	1	2	2	10	7	4	7	19	4	5	2	3				66
D-	1		3	3	6	5	10	11	6	3	2	1	1			52
E+		1	2	5		3	5	1	5	2		1	1			26
E			2	2	5	3	4	6	1	1	1	1				26
E-	1	1	1	3	1	1		1	3		1	1				14
F	8	15	31	65	78	60	86	145	87	59	57	45	29	6	7	778

Coefficient of correlation = .218

Probable error (r) = $\pm$.023

Matrix XXX

MATRIX SHOWING CORRELATION BETWEEN MECHANICAL APTITUDE AND MANUAL DEXTERITY

(Female)

Manual Dexterity.

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+							1	1	2	1	1	1				7
A						1	1	1	1			2				6
A-				1	2	1	6	6	7	1	3	1	1			29
B+	1		1	3	4	6	7	8	5	4	2	3	1			45
B				2	3	6	14	7	8	2	3		5	4	3	57
B-		1		3	7	9	7	14	4	6	6	2				59
C+	1	1	2	4	8	13	14	12	10	6	2	6	3	4	1	87
C	2	1	4	10	16	10	16	31	17	13	11	12	1		1	145
C-	3	2		4	10	7	8	13	8	11	7	4	3	2	4	86
D+		1	3	4	1	7	5	11	7	7	3	5	5	1		60
D		2	2	6	9	8	15	10	8	10	6	2				78
D-		1	2	2	3	7	8	10	9	7	6	3	3	3	1	65
E+			4	4	6		4	4	3	2	3				1	31
E			1	1	1	2		1	2	5	1	1				15
E-	1			2		1		1	2		1					8
F	8	9	19	46	70	78	106	130	93	75	55	42	22	14	11	778

Coefficient of correlation = .054

Probable error (r) = ±.024

Grid III

GRID SHOWING INTER-CORRELATIONS OF TESTS

(Total Group - Male and Female)

	1	2	3	4	5	6
1	-	.665 ±.009	.598 ±.010	.321 ±.014	.237 ±.016	.211 ±.016
2	.665 ±.009	-	.567 ±.011	.267 ±.015	.243 ±.016	.162 ±.016
3	.598 ±.010	.567 ±.011	-	.271 ±.015	.163 ±.016	.220 ±.015
4	.321 ±.014	.267 ±.015	.271 ±.015	-	.278 ±.015	.229 ±.015
5	.237 ±.016	.243 ±.016	.163 ±.016	.278 ±.015	-	.105 ±.016
6	.211 ±.016	.162 ±.016	.220 ±.015	.229 ±.015	.105 ±.016	-

1 = Linguistic Intelligence Test
2 = Standardised English Test
3 = Standardised Arithmetic Test
4 = Practical Intelligence Test
5 = Mechanical Aptitude Test
6 = Manual Dexterity Test

Matrix XXXI

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND ENGLISH

(Male and Female)

English

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+										1	1	1	1	5	3	12
A									1		1	1		3	4	10
A-									1	3	3	7	6	4	4	28
B+						1	3		3	12	7	12	7	9	3	52
B				2	1	2	3	10	17	17	15	23	13	13	3	119
B-			1	3	7	6	14	24	28	32	29	16	14	13	2	189
C+	2	2	1	4	6	15	41	50	54	39	28	16	13	6	1	278
C		3	4	5	23	36	44	69	58	39	21	11	5	3	1	322
C-	1	3	4	15	22	46	66	62	45	23	10	3	1	1		302
D+	6	3	9	22	29	38	47	39	13	6	4	2	1		1	220
D	5	10	10	14	22	23	18	19	8							129
D-	11	7	10	5	5	2	2	3	1							46
E+	5		1	2	3	1										12
E	3	1			1											5
E-		1														1
F	33	30	40	72	119	170	238	276	229	172	119	92	56	57	22	1725

Coefficient of correlation = .665

Probable error (r) = ± .009

Matrix XXXII

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND ARITHMETIC

(Male and Female)

Arithmetic

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+								1	3			2	1	1	4	12
A									2	1	1	1	1	1	3	10
A-									3	6	2	3	5	5	4	28
B+							1	5	5	14	10	5	6	3	3	52
B					1	3	8	21	22	16	13	10	8	5	12	119
B-				1	3	11	17	38	32	29	26	15	8	3	6	189
C+		1	1	4	10	17	31	55	41	44	23	19	14	9	9	278
C		1	2	14	29	39	56	57	58	32	16	5	6	3	4	322
C-		3	13	13	26	34	60	68	42	30	9	2		1	1	302
D+	4	9	19	15	22	44	43	31	19	7	4		1	2		220
D	6	2	13	12	17	26	20	17	10	4	2					129
D-	4	4	5	7	8	7	5	4			2					46
E+	4	2	1	3	1		1									12
E	2		2	1												5
E-	1															1
F	21	22	56	70	117	181	242	297	237	183	108	62	50	33	46	1725

Coefficient of correlation = .598

Probable error (r) = $\pm$.010

Matrix XXXIII

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND PRACTICAL INTELLIGENCE

(Male and Female)

Practical Intelligence

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1		1		1			1	1	3	2	2	12
A							1	1	2	3	1		1	1		10
A-					1		4	4	3	3	3	3	4	1	2	28
B+		1	1	3	1	3	3	10	7	6	4	4	3	3	3	52
B	1		3	4	2	5	8	20	22	13	9	12	7	7	6	119
B-	3	2	2	7	12	12	23	23	21	25	15	18	11	6	9	189
C+	7	2	5	10	17	18	42	48	30	22	25	22	10	13	7	278
C	6	8	10	18	20	32	40	47	39	28	27	18	10	9	10	322
C-	8	6	12	25	40	34	37	36	27	22	22	14	9	7	3	302
D+	6	15	15	23	18	29	24	27	29	14	8	5	1	3	3	220
D	5	9	9	16	17	13	17	12	10	9	3	3	4		2	129
D-	2	4	3	4	7	3	6	8	3	2	3		1			46
E+	2	2	1	2	1	2	1	1								12
E		1	1		1			1		1						5
E-										1						1
F	40	50	62	113	137	152	206	239	193	149	121	100	64	51	48	1725

Coefficient of correlation = .321

Probable error (r) = ± .014

Matrix XXXIV

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND MECHANICAL APTITUDE

(Male and Female)

Mechanical Aptitude

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+			1	1		1		2	3	2					2	12
A						1		1	1	2	2				2	9
A-	1			2	1	5	6	3	1	3	2	4				28
B+					4	1	7	8	5	5	7	3	5		1	46
B		1	2	4	7	11	10	27	15	5	13	13	7	1	2	118
B-		1	8	13	6	16	21	37	20	22	13	15	9	2		183
C+	1	4	14	13	27	15	36	41	34	25	27	20	7	1	4	269
C	2	8	9	16	25	21	48	60	44	29	14	20	11	1	5	313
C-	1	2	10	21	24	26	37	66	47	19	18	15	7	3	2	298
D+		7	13	23	23	20	28	42	27	13	13	4	4	1		218
D	4	1	4	19	14	15	15	17	15	7	5	4	1			121
D-	2	5	2	7	4	3	5	6	4	2	3					43
E+		3	1	1	1		3	1								10
E		1		2	1					1						5
E-			1													1
F	11	33	65	122	137	135	216	311	216	135	117	98	51	9	18	1674

Coefficient of correlation = .237

Probable error (r) = $\pm$.016

Matrix XXXV

MATRIX SHOWING CORRELATION BETWEEN LINGUISTIC INTELLIGENCE AND MANUAL DEXTERITY

(Male and Female)

Manual Dexterity

Linguistic Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					2			1	3	1	1	3			1	12
A					1		1	2	2	1	1	2				10
A-			2		3	3	1	5	4	4		2	3		1	28
B+			1	2	1	4	3	12	12	6	5	1	3	1	1	52
B			1	4	5	6	17	31	15	12	13	7	4	1	3	119
B-	1	2	2	2	23	19	35	28	22	15	20	10	4	4	2	189
C+	2	2	3	9	18	23	35	38	43	38	30	19	9	4	5	278
C	1	3	4	13	24	32	44	53	48	35	27	17	9	9	3	322
C-	1	5	6	21	34	26	41	52	43	22	18	13	9	8	3	302
D+		4	8	17	22	29	38	26	30	19	13	11	3			220
D	4	2	3	15	13	19	19	17	8	10	6	5	4	3	1	129
D-	4	2	2	4	3	7	4	6	7	4	2	1				46
E+	1	1	2	2	1	3	2									12
E			3	1					1							5
E-										1						1
F	14	21	37	90	150	171	240	271	238	168	136	91	48	30	20	1725

Coefficient of correlation = .211

Probable error (r) = ±.016

Matrix XXXVI

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND ARITHMETIC

(Male and Female)

Arithmetic

English	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+								1	3		5	4	2	2	5	22
A							3	5	8	7	8	8	9	4	5	57
A-						1	4	7	9	10	6	5	5	5	4	56
B+				2	1	5	6	9	17	14	7	5	7	9	10	92
B					5	8	12	20	18	19	13	5	7	5	7	119
B-			2	2	8	12	19	31	33	32	12	8	5	1	7	172
C+		1	3	6	9	18	26	36	48	42	11	13	9	2	5	229
C	1	4	7	7	17	22	47	68	35	27	25	9	2	4	1	276
C-	2	3	7	10	25	38	46	49	25	14	12	3	2		2	238
D+	3	4	11	10	22	31	28	25	19	10	4	1	1	1		170
D	2	2	6	11	7	26	18	24	14	6	2	1				119
D-	1	1	3	6	10	12	16	13	6		3		1			72
E+	5	2	5	7	3	3	6	6	1	2						40
E	3	1	6	6	3	4	6	1								30
E-	4	4	6	3	7	1	5	2	1							33
F	21	22	56	70	117	181	242	297	237	183	108	62	50	33	46	1725

Coefficient of correlation = .567

Probable error (r) = $\pm$.011

Matrix XXXVII

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND ENGLISH

(Male and Female)

English

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+		1		1	3	1	2	5	10	9	1	3	3	6	3	48
A			1	1	3	2	5	6	10	9	3	2	5	3	1	51
A-	3		1	1	2	1	7	5	10	10	10	5	3	5	1	64
B+		4	2	3	5	8	8	9	16	12	16	7	4	5	1	100
B	1	2	1	4	5	10	11	19	21	20	8	9	4	6		121
B-		1	6	4	10	11	14	24	25	8	16	8	8	10	4	149
C+	3	1	2	7	9	10	39	37	23	16	13	18	6	5	4	193
C	6	2	9	7	19	27	34	33	24	32	12	14	11	6	3	239
C-	4	5	2	11	14	22	27	43	27	19	14	7	5	3	3	206
D+	2	4	1	7	10	21	30	27	18	8	9	7	3	4	1	152
D	2	2	5	9	11	21	23	25	14	12	5	5	2		1	137
D-	3	5	2	7	10	16	18	15	17	8	8	3	1			113
E+	3	1	2	3	5	9	7	11	11	5		2		3		62
E	4	1	3	5	8	6	16	10	3	1	1		1	1		50
E-	2	1	3	2	5	5	7	7		3	3	2				40
F	33	30	40	72	119	170	238	276	229	172	119	92	56	57	22	1725

Coefficient of correlation = .267

Probable error (r) = $\pm$.015

Matrix XXXVIII

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND MECHANICAL APTITUDE

(Male and Female)

English

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+							2	2	3	1	2	1	1	4	2	18
A						2			3	2	1			1		9
A-	2		2		2	2	4	6	9	8	5	6	1	3	1	51
B+				3	7	9	6	12	15	21	6	7	5	5	2	98
B	2	1	1	7	6	7	11	21	17	11	6	9	6	9	3	117
B-	2	1	2	9	8	8	13	22	23	11	12	9	8	3	4	135
C+	2	2	2	2	11	21	31	45	34	31	9	9	9	8		216
C	2	5	9	12	25	28	40	47	46	30	29	17	9	9	3	311
C-	4	2	4	10	16	26	25	31	31	25	17	12	5	6	2	216
D+	2	5	4	2	11	13	28	24	13	11	10	6	2	3	1	135
D	4	3	5	8	8	20	22	25	13	10	5	6	6	2		137
D-	6	4	5	12	8	18	18	20	8	7	6	5	2	3		122
E+	2	2	3	2	7	6	14	10	5	1	7	4			2	65
E	3	2	2	1	3	5	8	3	3	2		1				33
E-		2		1	1	2	3						2			11
F	31	29	39	69	113	167	225	268	223	171	115	92	56	56	20	1674

Coefficient of correlation = .243

Probable error (r) = ±.016

Matrix XXXIX

MATRIX SHOWING CORRELATION BETWEEN ENGLISH AND MANUAL DEXTERITY

(Male and Female)

English

Manual Dexterity

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					1	2	2	1	3	3	3	2		1	2	20
A				3	3		1	9	4	5	3	1	1			30
A-					2	3	8	8	11	9	2	2	1	2		48
B+			3	1	1	13	11	15	15	13	8	4		5	2	91
B	2	2	3	5	5	13	11	20	25	22	13	8	4	3		136
B-	3	5	1	7	13	16	23	27	24	18	11	6	4	8	2	168
C+	4	1	4	7	8	24	32	41	34	29	14	18	11	7	4	238
C	3	5	6	11	21	19	28	45	41	24	23	23	9	11	2	271
C-	5	2	6	8	21	25	42	36	33	20	17	9	10	4	2	240
D+	5	3	2	8	25	21	25	22	16	14	9	8	6	6	1	171
D	3	4	4	10	9	14	28	27	10	9	9	6	7	7	3	150
D-	3	4	2	6	6	13	21	15	6	3	3	5	1	1	1	90
E+	3	2	4	2	2	4	4	4	4	1	4		1		2	37
E		1	3	1	1	2	1	5	3				1	2	1	21
E-	2	1	2	3	1	1	1	1		2						14
F	33	30	40	72	119	170	238	276	229	172	119	92	56	57	57	1725

Coefficient of correlation = .162

Probable error (r) = ±.016

Matrix XL

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND ARITHMETIC

(Male and Female)

Arithmetic

Practical Intelligence	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				2	1	3	5	7	9	7	6	5		1	3	49
A	1			1	1	5	2	9	8	6	5	7	2	2	2	51
A-			1		2	6	5	11	7	14	6	3	1	7	1	64
B+	1		2	3	5	6	7	16	21	14	9	7	4	1	5	101
B		2		3	8	9	16	18	25	17	8	7	5	2	1	121
B-	3	1	3	5	5	15	26	28	14	16	12	6	5	3	7	149
C+		1	7	1	12	20	22	44	31	14	14	11	6	6	7	196
C	1	2	7	3	22	19	38	42	39	24	13	8	11	3	8	240
C-	2	3	8	12	10	21	30	41	21	25	14	5	5	5	4	206
D+	1	4	5	10	13	15	33	21	18	20	7	1	5	2	1	156
D	3	2	8	9	10	26	22	21	16	12	5		2		3	139
D-	1	3	4	11	14	15	12	21	15	9	4	2	2		2	115
E+	2	3	6	3	8	6	10	7	6	2	5	1	2	1		62
E	3	3	4	5	3	9	9	5	6	1	2					50
E-	3		1	2	4	6	7	6	4	2	1	2			2	40
F	21	24	56	70	118	181	244	297	240	183	111	65	50	33	46	1739

Coefficient of correlation = .271

Probable error (r) = $\pm$.015

Matrix XLI

MATRIX SHOWING CORRELATION BETWEEN ARITHMETIC AND MECHANICAL APTITUDE

(Male and Female)

Arithmetic

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1		1	2	1	3	2		4	1	1	2	18
A		1						2	3		2	1				9
A-			1		1	4	6	10	9	10	4	3	1		3	51
B+		1	3	2	2	8	17	16	14	16	7	2	2	1	7	98
B		1	3	1	9	11	16	24	21	12	6	9		4		117
B-	1	3	3	5	8	10	17	19	22	21	9	5	4	2	6	135
C+	1	1	6	16	14	22	29	42	29	20	9	10	10	4	3	216
C	1	2	11	12	23	33	44	51	50	28	21	9	12	7	7	311
C-	2	5	5	10	14	23	35	38	27	31	17	4	3	8	4	216
D+			4	7	7	18	21	28	10	15	7	5	3	3	7	135
D	3	3	2	4	8	15	23	24	18	18	8	3	6		2	137
D-	6	1	6	5	19	17	12	17	8	9	11	3	3	3	2	122
E+	4	2	4		3	8	12	10	8	7	1	2	2		2	65
E	3	1	4	2	3	4	3	3	9		1					33
E-			1	2	4			3					1			11
F	21	21	53	67	115	174	237	288	231	179	103	60	48	33	44	1674

Coefficient of correlation = .163

Probable error (r) = ±.016

Matrix XLII

MATRIX SHOWING CORRELATION BETWEEN ARITHMETIC AND MANUAL DEXTERITY

(Male and Female)

Arithmetic

Manual Dexterity

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+						3	1		4	5	2	1	2	2	1	21
A					2	4	4	4	7	3	2	2	1	1		30
A-			1	1	2	2	4	10	10	5	4	3	1	1	4	48
B+	1	1	1	3	4	6	13	15	14	14	6	5	2	3	3	91
B	1	1	5	3	8	8	16	19	25	25	8	6	6	6	3	140
B-	1	4	1	4	9	18	28	39	20	17	13	4	5	4	2	169
C+	1		4	7	12	20	31	45	44	29	14	12	6	3	11	239
C	2	2	5	11	19	31	42	45	37	28	21	15	4	5	9	276
C-	2	3	10	11	13	29	34	49	29	25	13	5	14		3	240
D+	5	2	8	12	16	18	22	29	23	12	11	3	3	4	3	171
D	2	4	8	5	14	19	25	26	11	11	10	5	3	3	4	150
D-	1	5	7	5	8	16	16	10	8	6	4	2	1		2	91
E+	2	1	2	4	6	6	4	2	3	3	1	1	1	1	1	38
E	2		3	1	3	1	2	2	4		1		1			21
E-	1	1	1	3	2		2	2	1		1					14
F	21	24	56	70	118	181	244	297	240	183	111	65	50	33	46	1739

Coefficient of correlation = .220

Probable error (r) = ±.015

Matrix XLIII

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND MECHANICAL APTITUDE

(Male and Female)

Mechanical Aptitude

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+					2	3	5	8	4	5	3	7	4	1	3	45
A			1	1	1	4	4	4	9	2	9	4	6	1	2	48
A-			1	3	1	3	10	10	9	10	8	2	4		1	62
B+		1	3	7	6	8	13	19	6	8	8	7	5		3	94
B		3	2	3	5	10	12	17	20	10	15	14	4	3	2	120
B-	1	1	2	9	10	9	14	25	24	13	12	13	5	2	2	142
C+	1	2	8	16	16	15	18	44	26	19	13	7	4			189
C	3	6	10	7	19	22	28	49	33	19	16	10	8	1	3	234
C-	2	3	8	18	20	10	34	31	26	16	12	15	6			201
D+		3	8	10	17	16	20	29	16	11	11	6	3	1		151
D	1	4	6	16	11	10	15	32	14	9	5	5			2	130
D-	1		7	12	13	10	19	24	12	6	3	4	1			112
E+	1	5	2	7	5	7	10	5	12	4		1	1			60
E		3	3	6	9	3	10	11	1	1	1	1				49
E-	1	2	4	7	2	5	4	3	4	2	1	2				37
F	11	33	65	122	137	135	216	311	216	135	117	98	51	9	18	1674

Coefficient of correlation = .278

Probable error (r) = $\pm$.015

Matrix XLIV

MATRIX SHOWING CORRELATION BETWEEN PRACTICAL INTELLIGENCE AND MANUAL DEXTERITY

(Male and Female)

Manual Dexterity

Practical Intelligence

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1	3	4	4	8	10	9	1	6	3	1	1	51
A	1	1		1		5	12	8	9	3	3	4	3	2	1	53
A-					7	3	10	12	8	9	7	5	3	1		65
B+	1		1	6	9	6	12	21	11	9	10	5	6	2	5	104
B		2	1	4	8	17	9	19	21	15	17	5	7	2	2	129
B-			1	4	11	21	22	20	19	18	13	14	2	6	2	153
C+				17	17	13	35	34	34	26	17	12	3	5	3	216
C	3		9	12	19	27	28	52	46	25	18	13	6	3	3	264
C-	2	3	4	13	28	15	41	31	29	20	16	8	4	3	2	219
D+	2	2	5	8	20	20	27	32	10	12	10	8	3	4	1	164
D		3	1	12	12	10	21	25	23	18	12	2	1	1	1	142
D-	1	2	6	7	11	12	20	25	10	6	9	8	3			120
E+	1	2	5	4	7	8	6	7	12	1	3	3	3			62
E	2	4	3	5	6	6	10	7	3	3			1			50
E-	2	2	2	6	4	11	7	4	6	2						46
F	15	21	38	100	162	178	264	305	251	176	136	93	48	30	21	1838

Coefficient of correlation = .229

Probable error (r) = ±.015

Matrix XLV

MATRIX SHOWING CORRELATION BETWEEN MECHANICAL APTITUDE AND MANUAL DEXTERITY

(Male and Female)

Manual Dexterity.

Mechanical Aptitude

	E-	E	E+	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A+	F
A+				1			2	3	4	2	2	3		1		18
A					1	1	1	1	1		1	3				9
A-			1	1	3	1	10	14	9	4	5	2	1			51
B+	1		2	4	9	9	13	16	14	11	8	5	4	1	1	98
B				5	8	12	23	15	17	9	7	3	6	8	4	117
B-	2	1	2	7	10	17	16	27	15	14	12	7	4	1		135
C+	1	3	2	6	22	24	29	30	34	20	15	15	7	6	2	216
C	3	3	9	15	28	29	42	54	41	31	24	21	5	2	4	311
C-	3	5	2	13	22	19	31	35	23	21	17	12	7	2	4	216
D+	1	2	4	9	7	18	16	22	16	15	12	6	6	1		135
D	2	2	3	9	12	13	21	17	20	17	11	6	3	1		137
D-		2	5	7	8	16	13	17	17	12	11	5	4	4	1	122
E+		2	4	6	14	2	9	9	7	5	3		1	2	1	65
E		1	1	2	2	6	6	3	4	5	2	1				33
E-	1		1	3		1		1	3		1					11
F	14	21	36	88	146	168	232	264	225	166	131	89	48	29	17	1674

Coefficient of correlation = .105

Probable error (r) = ±.016

Chapter 10

A STATISTICAL STUDY OF SOME OF THE FACTORS INVOLVED IN THE CHOICE OF A CAREER

In this chapter the writer proposes to analyse the data which he obtained from the "Choice of Occupation" Questionnaire. (See pages 79 - 83 : Appendix A.) In this questionnaire the pupils were asked to put a 'nom de plume' instead of their real name at the top of the first page. The reason for this is perhaps fairly obvious, since it is usually found that pupils are very much more communicative when they know that those in authority, especially the teachers, will not see their answers. This idea worked extremely well and the personal element in all the answers to the questions asked is markedly noticeable.

A random sample of the 'noms de plume' which were used by the boys and girls is shown on the next two pages. Both boys and girls show a certain degree of ingenuity in their choice of a 'nom de plume' and one is agreeably surprised to find such distinctive titles as "The Unfinished Symphony", "Hereward the Wake", "Washington", "Il Trovatore", "Nurse Cavell", etc., etc., considering that many of the pupils came from very middle-class neighbourhoods. It is interesting to observe that the influence of the cinema (*) in the choice of a 'nom de plume' is not so great as the writer originally thought. In the case of the boys,

A RANDOM SAMPLE OF "NOMS DE PLUME"

(Male)

Dr. Barnardo
Sir John Moore
Blenheim
Caesar
The Vulture
Imagination
Hitler
Wellington
Sherlock Holmes
* The Frog
* Richard Dix
Robinson Crusoe
Dixon Hawk
Nelson
Washington
Edina
* Charlie Chan
Sexton Blake
McAlpine of theMists
James the First
Tommy Farr
Sparks
Cash On Delivery
Robert Burns
Bemersyde
Tootal
Cramond Brig
* George Robey
Rob Roy
Seaforth Highlander
Tollcross
Musically Minded
Mr. York of York
Persevere
Napoleon Bonaparte
Lady Killer
The Unfinished Symphony
Gold Flake
The Lord Provost
Gibraltar
Midlothian
* Richard Tauber

The Slasher
* Conrad Veidt
Romeo
Tough Guy
Tobacco
Bellevue
Il Trovatore
Pomeranian
Victor Hugo
* Will Fyffe
Jerry Dawson
Influenza
Schoolmaster
* Gene Autry
Announcer
Wee Willie
* Gordon Harker
The Black Douglas
Ginger
St. Bernard
Transport
Blue Bottle
Hereward the Wake
Panama
Swimmer
Tommy Walker
The Book Worm
Pepsodent
Wireless Fiend
* Wallace Beery
* Robert Taylor
S.M.T.
Aberdonian
Butcher's Boy
Bisto
Wait and See
Stalin
Joe Louis
Sir John Wolfe
* James Cagney
Unemployed
Baldie

approximately 14% have chosen 'noms de plume' which savour of the cinema, the corresponding figure for the girls being 13%.

A RANDOM SAMPLE OF "NOMS DE PLUME"

(Female)

Rinso
Spitfire
Alphabet
Wink
Croydon
Lamp Lighter
Whitehal 1212
Chatterbox
*Jeanette Macdonald
Tea Jenny
Dick Turpin
Belinda
Freckles
The Flower of Dunblane
Aurora
Dimples
Lady Elphinstone
Erin
Ambitious
Nurse Cavell
Lucky Star
*Madeline Carrol
Enthusiasm
Café Colette
Tom Thumb
Joan of Arc
Madge Wildfire
Peter Pan
Heart of Midlothian
Dainty Dinah
Optimist
*Janet Gaynor
Black Beauty
Bright Eyes
Lucille
Ultramarine
Snowdrop
Audacious
Cherry Ripe
Philip of Spain
Three Sevens
*Mae West

Rip Van Winkle
Bannockburn
Curly Locks
Geranium
Princess Charming
*Gracie Fields
Forget-me-not
Gallipoli
Ravenswood
Dear Wee Thing
*Kay Francis
Outdoor Girl
*Joan Crawford
Apple Pie
Radio Paris
Mrs. Grundy
Hyacinth
Girl Guide
Commonsense
*The Rose of Tralee
Salisbury Crags
Spindles
*Merle Oberon
Silk Worm
Typist
In Town Tonight
Perseverance
Cinderella
*Margaret Lockwood
Black Shadow
Flora Macdonald
Hopeful
Pye
Clerkess
*Laughing Irish Eyes
Secret Service
Lorna Doone
Sea-devil
Factory Worker
*Patsy Kelley
*Myrna Loy
Montrose

Note:- On the third page of the Questionnaire the pupils were asked to insert their real name in the space provided for the purpose.

TABLE I

		Number	%
Male	Number of individuals who made some definite choice of occupation.	854	89.43
	Number of individuals who were undecided as to their future career, but who expressed a desire to follow a particular occupation.	101	10.57
Female	Number of individuals who made some definite choice of occupation.	737	83.47
	Number of individuals who were undecided as to their future career, but who expressed a desire to follow a particular occupation.	146	16.53
Male and Female	Number of individuals who made some definite choice of occupation.	1591	86.56
	Number of individuals who were undecided as to their future career, but who expressed a desire to follow a particular occupation.	247	13.44

Table I shows an analysis of the answers to Questions 1 and 3 of the 'Choice of Occupation' Questionnaire. It will be observed that in the case of the male group 854 individuals, or 89.43% of the total male group, indicated that they had made some definite choice of occupation, while

101 individuals, or 10.57%, indicated that they were undecided as to their future career, but who expressed a desire to follow a particular occupation. When we come to consider the female group, we find that 737 individuals, or 83.47% of the total female group, indicated that they had made some definite choice of occupation, while 146 individuals, or 16.53%, were undecided but expressed a desire to follow a particular occupation. A comparison of these results therefore reveals that boys, generally, are much more definite and decisive in the expression of their occupational intentions than girls of a similar age. Table I also shows that 1591 individuals, or 86.56% of the total group (male and female) indicated that they had made some definite choice of a career, while the remaining 247 individuals, or 13.44%, were undecided as to their future choice of career.

According to Vernon (1), the following would seem to be the most important motives involved in the choice of careers: (a) social conformity, (b) humanistic tendencies, (c) active tendencies, (d) impulse towards freedom and independence, (e) security, (f) ease, pleasure, and amusement, (g) superiority, (h) power, and (i) social admiration. Motivation in the choice of a career is sometimes extremely difficult to determine precisely, but the order of importance of the above motives, in the case of the boys tested in this scheme, would seem to be as follows:-

(1) Security

(2) Active tendencies

(3) Freedom and independence

(4) Superiority

(5) Social conformity

(6) Ease, pleasure and amusement

(7) Social admiration

(8) Humanistic tendencies

(9) Power

For girls the order is:-

(1) Security

(2) Active tendencies

(3) Humanistic tendencies

(4) Ease, pleasure and amusement

(5) Social conformity

(6) Superiority

(7) Freedom and independence

(8) Social admiration

(9) Power

A comparison of these two ranking lists shows that, for both boys and girls, security is the most important single motive in the choice of a career; active tendencies, social conformity and power all occupy similar positions in the ranking lists for both sexes; freedom and independence and superiority and social admiration are stronger motives in the boy's choice of a career; while humanistic tendencies and ease, pleasure and amusement are stronger in the girl's choice of a career.

On the next few pages are to be found a selected number of reasons given by boys and girls in answer to Question 2 of the "Choice of Occupation" Questionnaire. There are 39 reasons given by boys and 43 by girls; some of the former are especially humorous!

REASONS GIVEN FOR THE CHOICE OF OCCUPATION

(Male)

(1) "I intend being a grocer because it is an inside job and when it is raining you are able to work and you are not sent home because of the weather."

(2) "I want to be a policeman because I think the job is easy. All you have to do is to walk up and down the street."

(3) "I should like to be a motot mechanic as I am better with my hands than with my head."

(4) "I would like to be a page-boy because I am small and light-footed."

(5) "I am going to be a scavenger because it is good pay and because you receive 2 working suits in the year, 1 for the winter and the other for the summer."

(6) "I have made up my mind to be a bus-driver. When I am always in the bus I like to see the driver driving the bus and I often say to myself I wish that it was me that was driving the bus."

(7) "I want to be a butcher because I like to work with blood and meat. I've had some practice in the trade."

(8) "I am going to be a sailor. I made up my mind because my brother has kept on being promoted and has fattened up a lot since he

joined the Navy."

(9) "I am going to be a policeman as I am big built and have very large feet."

(10) "I want to be a blacksmith because it keeps your muscles sturdy with swinging the hammer and making horse shoes."

(11) "I would like to be a cinema operator as I would get to see the films without paying for them."

(12) "I want to be a commercial traveller because my father has been a traveller for a few years now and I am going to follow in his footsteps."

(13) "I am going to be a sailor but I have no particular reasons for wanting to become a sailor, I suppose the call of the sea seems to be in my blood."

(14) "I intend being a dental mechanic because it is an interesting job and it would be so nice to think that you have been able to make people half-respectable looking with false teeth."

(15) "I intend to obtain a post in the Civil Service. I made this choice because I am well fitted for this type of occupation and I am sure that it has many prospects for people, like myself, who are amibitious."

(16) "I should like to be a draughtsman because I am quite good at technical drawing and my stammer wouldn't affect my work in such an occupation."

(17) "I am going to be a sailor so that I can see the world and tell all my relations that I have seen the various places that are famous in history."

(18) "I want to be an engineer because all my uncles have something to do with the engineering trade, and they fit it so well."

(19) "I want to be a marine engineer, because the pay you get will help you to keep your wife and family, when you marry, and also your father and mother in their old age."

(20) "I am going to be a cabinetmaker, because I love the tools which I handle. This may seem to be a funny reason but it's true."

(21) "I am going to be an airman as you have a chance of rising far and it is also very exciting."

(22) "I intend to follow the occupation called draughtsman. I have made this choice because I feel well able to make a success of it. My own personal guidance and the guidance of my Technical Drawing Teacher have made me wish to follow this particular occupation."

(23) "I am going to join the Police Force, if I can. I have made this choice because I am tall, because the pay is good, and because you lead an open-air life. I do not like wrong-doers and I would like to stop thefts."

(24) "I wish to join the R.A.F. because, in years to come, aviation will have become very popular with everybody and I would like to have done something to popularise it."

(25) "I intend being a plasterer because my uncle, who is a plasterer, has no sons and he is leaving the business to me to carry on. My father made me want to go too, because he says that his old hairdresser's shop is no place for me to work in."

(26) "I am going to follow the trade of baker as I have a real interest

in cakes, scones, and bread."

(27) "I am going to join the Army when I am old enough, because my father, three uncles, four cousins, my grandfather, and my three brothers are in the Army, and I intend to follow in their footsteps."

(28) "I intend working as a clerk in an office because it is warm and you don't catch cold so easily as in an outside job."

(29) "I would like to be a printer because I would like the work, printers have good hours and good pay, and my father and uncle are both printers so I will have every chance of success."

(30) "I am going to be a clerk because it is a nice clean job."

(31) "I want to be a painter, because my friend is the gaffer and he said I could get a job whenever I want one."

(32) "I intend being a cartoonist because my Art Teacher says that I am very good at drawing. I like to sketch comic figures and it gives me great satisfaction and delight to see any resemblance to the true character. I first was inspired when I bought a book of pictures called "Dictators and their Faults".

(33) "I want to join the Navy as my grandfather has told me so much about the fun he had that I can't get in quick enough".

(34) "I think I would like to be a commercial traveller. I made this choice because I know I belong to the unsettled type. I would like the open-air life and am not inclined to sit in an office or work in a building. It's far too monotonous."

(35) "I would like to become a tinsmith because I think I am best fitted

for a job like that and because I am no genius with my head."

(36) "My mother says I should go on the stage as a comedian as I often act very daftly and make a lot of wise-cracks."

(37) "I intend being a Ladies' Hairdresser because I think I would like putting waves into beautiful women's hair."

(38) "I would like to be in the Civil Service because I want to be better than my father, who is a brewery worker, and because my mother says that I should take the chance of progressing, as my father has never been able to take that chance".

(39) "I am going to be a musician because I can play two instruments already and am picking up another. I would like to pay back my mother everything she has spent on me because it was she who gave me the opportunity".

REASONS GIVEN FOR THE CHOICE OF OCCUPATION

(Female)

(1) "I am going to be a comptometer operator. I feel fitted for this job because my teacher says that I am very good at typewriting and you use very similar movements when you work a comptometer."

(2) "I am going to be a typist because it seems a very pleasant job and because it is my favourite subject in my commercial course. It makes ordinary writing look terribly laborious."

(3) "I would like to be a typist and feel fitted for this job because as

a typist I'll work indoors and some people feel faint when they have been indoors for a while, but not me. I know also that I would always obey orders and remember my manners."

(4) "I am going to be a clerkess because I know that office people are always very friendly and I wish to make chums with my fellow-workers."

(5) "I would like to be a shop assistant more than anything else, because it is a cheery job and one is always seeing new faces."

(6) "I want to be a shop assistant. My reason for this is that I like serving people and showing people beautiful dresses. I often watch girls serving in large shops and it makes me wish that I was in their place."

(7) "I would like to work in a shoes shop because I like fitting on shoes and going up and down ladders."

(8) "I intend working in a florist's shop. I am very interested in flowers and have a garden of my own. I believe that I have the "touch" which is so necessary when one is handling flowers. I hope to own a shop of my own some day."

(9) "I would like a job which keeps my brain alert and one which will not allow me to forget my school work. I therefore think that the Civil Service will keep my mind alert and active."

(10) "I intend being a hairdresser because I like to try to set my hair in different ways and see the results. In this way I learn to improve my own hair and also learn to improve other people's."

(11) "I think I am specially fitted for the following careers:- Author,

Book-keeper, Civil Servant, Librarian, Clerkess, Secretary, and Telegraphist. I am taking a Commercial Course at school and have at least the average amount of knowledge required for these jobs."

(12) "I want to be a shop assistant because I like wrapping up parcels and asking customers what they want. I think I am fitted for this kind of work as it does not take much brains."

(13) "I am going to be a shorthand typist because I think I am fitted for it. It would be stupid to think of any other occupation because I have been training for it for the past three years and like it very much."

(14) "I intend being a clerkess because I think it makes your brain work very hard and I like hard work of this sort. I am taking shorthand and book-keeping at school and I want to make use of these subjects in my future occupation."

(15) "I am going to work in a shop because my best friend works in a shop and she is always telling me how good it is in a shop."

(16) "I want to be a lady doctor but I don't think my parents can afford any further education for me. I think I should be well fitted for such a career because I have been first in my class for three years now. If I can't be a doctor, I should very much like to be a nurse as both types of careers seem to me to be very similar."

(17) "I have always wanted to be a lady reporter. I think I am well fitted for this occupation as I am good at English and read a lot. Another reason for my choice is the fact that this type of occupation is full of adventure and you are always on the "go"."

(18) "Of all the subjects I have had at school I can truthfully say

I likedthe Commercial Subjects best. Therefore I feel that to succeed in life one would be best to follow the work you can do most efficiently. I have therefore chosen secretarial work because I am best fitted for it. I like this career because it deals with the commercial side of the world."

(19) "I intend being a manicurist. I like keeping my own hands and nails clean and tidy, and wish to earn my living by trying to do the same for other people. I think dirty and untidy hands are horrible and also cause a lot of disease."

(20) "I want to be a cook because I am good at my domestic subjects. My father and mother are not very rich, and if I get a job as a domestic servant they would not have to feed me and that wouldhelp them a lot."

(21) "I want to be a domestic servant rather than a factory girl. The reasons for picking this choice is that I won't get out so much and get into bad company."

(22) "I want to be a children's nurse because, if your employers are good talkers, you learn how to speak properly and when going holidays you will have a chance of seeing places. I like little children very much indeed."

(23) "I intend being an Air Pilot. I am big and strong and have been up in an aeroplane quite a few times. If Mrs. Kirby Green can fly to the Cape, well so can I."

(24) "I am going to be a cook because I like cooking. I also like eating home-baked things and it would be so nice to give your husband, if you get one, home-baked things."

(25) "I intend being a waitress because some day I may have a home of my

own and I want to be able to set a table properly and arrange the food nicely".

(26) "I would love to be a baby's nurse because I love babies especially when they are very small. No one has influenced me. I have thought this out for myself."

(27) "I am going to be an authoress. The reason I would like to be an authoress is that, when I was eleven years old, I found that I could make up speeches and verse, especially about any one I didn't like. My parents, when they read my efforts, were very enthusiastic about this career and are going to give me further education."

(28) "I am going to be a shop assistant because I think I would enjoy this work. I have often helped the shop-keeper at the foot of our stair and she says it is not a good job but that didn't alter my decision."

(29) "I am going to be a shop assistant because my father and mother wish me to follow this occupation. Of course, I wouldn't be a shop assistant unless I liked and felt fitted for this job myself."

(30) "I intend being a dressmaker, because dressmaking is my best subject at school. I aleo admire lovely dresses and the cheapest way of getting them is to make them for yourself."

(31) "I am going to work in an office because you have not to stand up for long."

(32) "I am going to work in a Laundry because I like the work. It will be a good thing for me too when I get married because I can wash all my children's clothes and iron them neatly."

(33) "I am going to be a dress-designer. I like to dress up my sister

in odd pieces of cloth and like to see the result. I am also good at painting old fashioned dresses in colour. I think this sort of game gives you good practice for your future job."

(34) "I intend to become a typist because all the rest of the family have done so. I am also in the Commercial Class and all the teaching would be wasted if I took up another occupation."

(35) "I have not yet decided what occupation I shall follow, but I would greatly like to work in a library, preferably one of the Public Libraries, of which I am a member. I should like to work in the Junior Library in George IV Bridge. I am very fond of reading, I am good at English and am very interested in anything to do with books. You may think this funny, but I hate to see books being ill-used because I love books. I wish some of my class-mates were more careful of their books."

(36) "I am going to be a shop assistant because it is a much cleaner job than working in a factory."

(37) "I am going to be a nurse because I love helping people who can't help themselves. I am not afraid of blood and am big and strong. I am also fairly clever so that I think I am specially fitted for nursing."

(38) "I am going to be an acrobatic dancer. I am not clever at school and have been influenced by other people who are dancers. I am well fitted for this job as I am double-jointed, as you might say."

(39) "I am going to be a cash girl because I think I would like that job and because I am good at Arithmetic. My father is unemployed and my mother has to go out and work, so I want to get a good job so that I can help them."

(40) "I am going to work in a box factory because my sister has been there for four years and has never yet complained about it."

(41) "I intend being a clerkess as my motheris a good counter and I like counting."

(42) "I am going to be a dressmaker because I am a good sewer. There are also a lot of fashions and new ideas which I would like to introduce into the art of dressmaking."

(43) "I intend being a children's nurse of a hospital nurse. I am very fond ofyoung babies and like them better than older ones. It wouldn't much matter whether I worked in a babies' hospital or an elderly hospital."

TABLE SHOWING NUMBER OF OCCUPATIONS MARKED IN 'CHOICE OF OCCUPATION' QUESTIONNAIRE BY ALL GROUPS.

Table II

Number of occupations	Male	Female	Male and Female
1 - 2	83	98	181
3 - 4	149	169	318
5 - 6	226	241	467
7 - 8	225	208	433
9 - 10	103	88	191
11 - 12	63	60	123
13 - 14	44	17	61
15 - 16	39	2	41
17 - 18	13	-	13
19 - 20	9	-	9
21 - 22	1	-	1
	955	883	1838

Pages two and three of the "Choice of Occupation" Questionnaire contain a list of some three hundred occupations, 172 of which are predominantly male, 32 predominantly female, and 96 of which are followed by both sexes. In the questionnaire the pupils were asked to place a cross opposite the occupations at which they would like to work. Table II above shows the number of occupations marked in the list by both boys and girls. It will be observed that, in the male group, the number of occupations marked varies from one to twenty-two, while, in the female group, the range is from one to sixteen. Table III, on the next page,

TABLE SHOWING NUMBER OF OCCUPATIONS (EXPRESSED IN PERCENTAGES) MARKED IN 'CHOICE OF OCCUPATION' QUESTIONNAIRE BY ALL GROUPS.

Table III

Number of occupations	Male %	Female %	Male and Female %
1 - 2	8.69	11.10	9.85
3 - 4	15.61	19.14	17.31
5 - 6	23.67	27.29	25.40
7 - 8	23.56	23.56	23.56
9 - 10	10.78	9.97	10.39
11 - 12	6.60	6.80	6.69
13 - 14	4.61	1.92	3.32
15 - 16	4.08	.22	2.23
17 - 18	1.36	-	.71
19 - 20	.94	-	.49
21 - 22	.10	-	.05
	100.00	100.00	100.00

shows the frequencies in Table II expressed as percentages. This table shows that the average number of occupations marked falls within the range 5 - 8. In the male group 23.67% marked five or six occupations, the corresponding for the female group being 27.29%; while in both the male and female groups 23.56% marked seven or eight occupations. The actual mean number of occupations marked by the boys is 7.228, while the mean for the girls is 6.128. So that the boys, when confronted with a list of occupations, tend to mark more occupations than the girls. This is however to be expected, since the number of strictly male occupations far exceeds the number of strictly female. In fact, when we come to to consider this rather biassed division of occupations, we are surprised to find that the difference between the average number of occupations marked is so small.

On page 4 of the "Choice of Occupation" Questionnaire the pupils were given a list of some eighteen reasons which have been found to influence the choice of a career. They were instructed to put the figure 1 opposite the reason or influence which had been strongest in determining their choice of occupation, the figure 2 opposite the second most powerful influence, and so on. If any of the reasons did not influence them, they were told to disregard them altogether.

Male Group

Table IV shows the frequency distribution of the number of reasons given by the individuals in the various school male groups and in the total male group. The number of reasons which operate in the determination of the choice of a career vary from one to nine for this group. It will be observed that every member of the group tested (955 individuals) mentioned at least one of the selected reasons as operating in his choice of occupation. Table V shows the individual frequencies of the previous Table expressed as percentages. This Table shows that 5.45% of the total group mention one of the eighteen reasons, 11.83% mention two of the reasons, 34.66% mention three of the reasons, etc.

Female Group

Table VI shows the distribution of the number of reasons given by the 883 individuals who compose the total female group. The number of reasons involved in the choice of a career vary from one to nine, as for the previous group. Table VII shows that 4.98% mention

Table IV

Male Group

Number of Reasons	School				Total
	T	B	J.C.	D.K.	
1	15	9	15	13	52
2	31	39	28	15	113
3	119	93	70	49	331
4	73	66	43	40	222
5	75	29	27	26	157
6	21	9	12	5	47
7	4	9	5	3	21
8	-	3	6	2	11
9	-	1	-	-	1
	338	258	206	153	955

Table V

Male Group

Number of Reasons	Number of Individuals	Percentage
1	52	5.45
2	113	11.83
3	331	34.66
4	222	23.25
5	157	16.44
6	47	4.92
7	21	2.20
8	11	1.15
9	1	.10
	955	100.00

Table VI

Female Group

Number of Reasons	School T	B	J.C.	D.K.	Total
1	17	12	12	3	44
2	49	26	30	17	122
3	107	101	73	32	313
4	72	49	24	15	160
5	40	31	17	18	106
6	29	4	19	10	62
7	23	1	13	8	45
8	12	3	7	4	26
9	3	-	2	-	5
	352	227	197	107	883

Table VII

Female Group

Number of Reasons	Number of Individuals	Percentage
1	44	4.98
2	122	13.81
3	313	35.44
4	160	18.12
5	106	12.01
6	62	7.02
7	45	5.10
8	26	2.94
9	5	.58
	883	100.00

Table VIII

(Total Group - Male and Female)

Number of Reasons	School				Total
	T	B	J.C.	D.K.	
1	32	21	27	16	96
2	80	65	58	32	235
3	226	194	143	81	644
4	145	115	67	55	382
5	115	60	44	44	263
6	50	13	31	15	109
7	27	10	18	11	66
8	12	6	13	6	37
9	3	1	2	-	6
	690	485	403	260	1838

Table IX

(Total Group - Male and Female)

Number of Reasons	Number of Individuals	Percentage
1	96	5.22
2	235	12.78
3	644	35.03
4	382	20.80
5	263	14.31
6	109	5.93
7	66	3.59
8	37	2.01
9	6	.33
	1838	100.00

Table X

	School				Total
	T	B	J.C.	D.K.	
Total number of reasons given	1255	925	743	547	3470
Total number of pupils (male)	338	258	206	153	955
Average number of reasons/pupil	3.71	3.59	3.61	3.58	3.63

Table XI

	School				Total
	T	B	J.C.	D.K.	
Total number of reasons given	1382	773	751	431	3337
Total number of pupils (female)	352	227	197	107	883
Average number of reasons /pupil	3.93	3.41	3.81	4.03	3.78

Table XII

	School				Total
	T	B	J.C.	D.K.	
Total number of reasons given	2637	1698	1494	978	6807
Total number of pupils (M and F)	690	485	403	260	1838
Average number of reasons/pupil	3.82	3.50	3.71	3.76	3.70

one of the reasons contained in the selected list of eighteen, 13.81% mention two of the reasons, 35.44% mention three of the reasons, etc.

Total Group - Male and Female

Tables VIII and IX show the corresponding data for the groups taken as a whole.

Tables X, XI, XII shows the total number of reasons given by the total male group, total female group, and the total group (male and female). The male group gave 3740 reasons, the average number of reasons/pupil being 3.63; the female group gave 3337 reasons, the average number of reasons/pupil being 3.78. The corresponding average for the total group is 3.70. As far as the number of reasons, which operate in the choice of a career, is concerned, there would therefore seem to be no significant sex differences.

Table XIII shows the eighteen individual reasons classified according to the frequency with which they were chosen by the male group. It will be observed that, in so far as frequency of choice is concerned, the reason, "Because it is a secure occupation and there is not much chance of becoming unemployed", occupies first place, being mentioned 445 times, or 12.82%, in a total of 3470 reasons. This is in accordance with the previously established observation that security is the most important single motive in the choice of a career. The reason, "Because I think I should like this particular job", came second, being mentioned 434 times, or 12.51%, in the total number of reasons given. The reason, "Because this occupation is well paid", occupies third place and the reason "Desire of father that this occupation should be followed",

Table XIII

TABLE SHOWING INDIVIDUAL REASONS CLASSIFIED ACCORDING TO THE FREQUENCY OF CHOICE

(Male Group)

	Reason	Frequency of choice	%
A	Because it is a secure occupation and there is not much chance of becoming unemployed..........	445	12.82
B	Because I think I should like this particular job..	434	12.51
C	Because this occupation is well paid............	385	11.10
D	Desire of father that this occupation should be followed...	343	9.88
E	Because I feel fitted for this kind of work......	329	9.48
F	Because it offers great prospects of advancement..	297	8.56
G	Because it requires skill rather than labour.....	240	6.92
H	Desire of mother that this occupation should be followed...	205	5.91
I	Because it is an out-door occupation.............	163	4.70
J	Because it is my father's occupation............	136	3.92
K	Because the hours are easy......................	122	3.52
L	Because it is my friend's occupation............	110	3.17
M	Because it is my brother's occupation...........	98	2.82
N	Because it is easy to get a job of this kind.....	56	1.61
O	Because I have already been offered a job of this kind..	54	1.56
P	Because of the influence or suggestion of my teacher...	47	1.36
Q	Because it is my sister's occupation............	4	.11
R	Because it was my mother's occupation...........	2	.05

TABLE SHOWING INDIVIDUAL REASONS CLASSIFIED ACCORDING TO THE FREQUENCY OF CHOICE AND THE FREQUENCY OF ORDER

Table XIV

Reason	Order 1	2	3	4	5	6	7	8	9	No. of times chosen
A	174	141	65	39	15	11	-	-	-	445
B	118	89	91	64	49	15	2	6	-	434
C	51	119	117	55	35	5	3	-	-	385
D	190	81	42	16	8	3	2	1	-	343
E	115	93	73	29	11	6	1	1	-	329
F	50	53	84	59	37	9	4	1	-	297
G	33	48	77	53	20	7	2	-	-	240
H	43	53	55	30	13	6	3	1	1	205
I	34	47	34	31	11	3	3	-	-	163
J	36	46	35	10	6	1	2	-	-	136
K	13	37	34	19	12	3	2	2	-	122
L	34	32	25	14	3	1	1	-	-	110
M	34	24	22	12	4	2	-	-	-	98
N	12	13	11	9	4	5	2	-	-	56
O	5	11	12	12	7	3	4	-	-	54
P	12	12	13	6	2	-	2	-	-	47
Q	1	2	-	1	-	-	-	-	-	4
R	-	2	-	-	-	-	-	-	-	2
Order Frequency	955	903	790	459	237	80	33	12	1	3470

(Male Group)

occupies fourth place. The frequency with which the other reasons were chosen is shown in Table XIII.

Table XIV shows the individual reasons classified according to the frequency of choice and the frequency of order. By frequency of order, we mean, the number of times a particular reason is given first place by an individual as indicating that that reason has been the most important in determining his choice of occupation; second place as indicating the second most important reason in the choice of his career, and so on. It will be observed that the reason which is placed first in the great majority of cases is, "Desire of father that this occupation should be followed", being placed first 190 times out of a total frequency of choice of 343. "Because it is a secure occupation and there is not much chance of becoming unemployed" is placed first 174 times in a total frequency of choice of 445. The Table also shows the number of times the various reasons were placed second, third, fourth, etc.

Female Group

Table XV shows the reasons classified according to the frequency of choice for the female group. For this group, the reason which occupies first place is, "Because I think I should like this particular job", being chosen 464 times, or 13.91%, in a total of 3337 reasons. The reason, "Because this occupation is well paid", occupies second place, being chosen 406 times. "Because it is a secure occupation, etc." and "Desire of mother that this occupation should be followed", occupy third and fourth places, being chosen 360 and 307 times respectively. The frequency with which the other reasons are chosen is also shown in Table XV.

Table XV

TABLE SHOWING INDIVIDUAL REASONS CLASSIFIED ACCORDING TO THE FREQUENCY OF CHOICE

(Female Group)

	Reason	Frequency of choice	%
A	Because I think I should like this particular job..	464	13.91
B	Because this occupation is well paid...........	406	12.17
C	Because it is a secure occupation and there is not much chance of becoming unemployed.........	360	10.79
D	Desire of mother that this occupation should be followed....................................	307	9.19
E	Because I feel fitted for this kind of work.....	302	9.05
F	Because it offers great prospects of advancement	293	8.78
G	Because the hours are easy..................	248	7.43
H	Desire of father that this occupation should be followed....................................	213	6.38
I	Because it requires skill rather than labour....	148	4.43
J	Because it is my friend's occupation...........	142	4.25
K	Because it is easy to get a job of this kind....	109	3.26
L	Because it is my sister's occupation...........	93	2.78
M	Because of the influence or suggestion of my teacher....................................	71	2.13
N	Because it was my mother'soccupation...........	71	2.13
O	Because I have already been offered a job.......	48	1.44
P	Because it is an out-door occupation...........	26	.78
Q	Because it is my father's occupation...........	26	.78
R	Because it is my brother's occupation..........	10	.33

TABLE SHOWING INDIVIDUAL REASONS CLASSIFIED ACCORDING TO THE FREQUENCY OF CHOICE AND THE FREQUENCY OF ORDER

Table XVI

Reason	Order 1	2	3	4	5	6	7	8	9	Frequency of Choice
A	174	87	84	52	33	25	8	1	-	464
B	65	128	100	64	32	11	3	3	-	406
C	113	88	69	43	27	11	5	4	-	360
D	86	82	66	35	16	14	7	1	-	307
E	97	107	47	22	15	6	6	2	-	302
F	63	70	63	32	33	17	10	5	-	293
G.	31	59	69	42	29	7	6	4	1	248
H	69	65	28	21	15	10	4	-	1	213
I	25	22	46	17	15	11	5	4	3	148
J	24	36	46	13	11	7	3	2	-	142
K	19	22	29	21	5	7	5	1	-	109
L	36	25	16	6	5	2	1	2	-	93
M	23	9	14	12	4	4	4	1	-	71
N	35	15	9	7	1	1	2	1	-	71
O	9	10	8	13	1	2	5	-	-	48
P	4	9	8	2	1	1	1	-	-	26
Q	7	4	13	-	1	-	1	-	-	26
R	3	1	2	2	-	2	-	-	-	10
Frequency of Order	883	839	717	404	244	138	76	31	5	3337

(Female Group)

Table XVI shows the various reasons classified according to the frequency of choice and the frequency of order for the female group. It will be noted the reason which first most often by the female group is, "Because I think I should like this particular occupation", being placed first 174 times in a total frequency of choice of 464. "Because it is a secure occupation, etc." is placed first 113 times in a total frequency of choice of 360. "Because I feel fitted for this kind of work" is placed first 97 times in a total frequency of choice of 302.

An examination of the contents of Tables XIII and XV reveals the following interesting observations:-

(a) By far the most important reasons, in so far as frequency of choice is concerned, are:-

(i) "Because I think I should like this particular job."

(ii) "Because it is asecure occupation and there is not much chance of becoming unemployed."

(iii) "Because this occupation is well paid."

(b) Boys are influenced more by the security of a job, girls more by its financial prospects.

(c) Father have about the same degree of control over the occupational destiny of their sons as mother have of their daughters.

(d) Boys tend to follow their fathers' occupations much more readily than girls follow their mothers'.

(e) Friends have more influence in a girl's choice of a career than they have in a boy's.

(f) Teachers have more influence on a girl's future choice of occupation than they have on a boy's.

(g) Girls are much more influenced by jobs which have "easy hours"

TABLE SHOWING INDIVIDUAL REASONS CLASSIFIED ACCORDING TO THE FREQUENCY OF CHOICE

Table XVII

(Total Group - Male and Female)

	Reason	Frequency of choice	%
A	Because I think I should like this particular job..	898	13.19
B	Because it is a secure occupation and there is not much chance of becoming unemployed...........	805	11.82
C	Because this occupation is well paid.............	791	11.62
D	Because I feel fitted for this kindof work........	631	9.27
E	Because it offers great prospects of advancement..	590	8.67
F	Desire of father that this occupation should be followed....................................	556	8.17
G	Desire of mother that this occupation should be followed....................................	512	7.52
H	Because it requires skill rather than labour.....	388	5.70
I	Because the hours are easy......................	370	5.44
J	Because it is my friend's occupation.............	252	3.70
K	Because it is out-door occupation................	189	2.78
L	Because it is easy to get a job of this kind.....	165	2.42
M	Because it is my father's occupation.............	162	2.38
N	Because of the influence or suggestion of my teacher.......................................	118	1.73
O	Because it is my brother's occupation............	108	1.59
P	Because I have already been offered a job of this kind...	102	1.50
Q	Because it is my sister's occupation.............	97	1.43
R	Because it was my mother's occupation............	73	1.07

TABLE SHOWING INDIVIDUAL REASONS CLASSIFIED ACCORDING TO THE FREQUENCY OF CHOICE AND THE FREQUENCY OF ORDER

Table XVIII

Reason	Order 1	2	3	4	5	6	7	8	9	Frequency of Choice
A	292	176	175	116	82	40	10	7	-	898
B	287	229	134	82	42	22	5	4	-	805
C	116	247	217	119	67	16	6	3	-	791
D	212	200	120	51	26	12	7	3	-	631
E	113	123	147	91	70	26	14	6	-	590
F	259	146	70	37	23	13	6	1	1	556
G	129	135	121	65	29	20	10	2	1	512
H	58	70	123	70	35	18	7	4	3	388
I	44	96	103	61	41	10	8	6	1	370
J	58	68	71	27	14	8	4	2	-	252
K	38	56	42	33	12	4	4	-	-	189
L	31	35	40	30	9	12	7	1	-	165
M	43	50	48	10	7	1	3	-	-	162
N	35	21	27	18	6	4	6	1	-	118
O	37	25	24	14	4	4	-	-	-	108
P	14	21	20	25	8	5	9	-	-	102
Q	37	27	16	7	5	2	1	2	-	97
R	35	17	9	7	1	1	2	1	-	73
Order Frequency	1838	1742	1507	863	481	218	109	43	6	6807

(Total Group)

than are boys.

(h) Boys are much more interested in occupations which "require skill rather than labour" than are girls.

(i) Boys are more influenced by "out door" occupations than are girls.

(j) Girls find it easier to get a job in which they are interested than boys.

Total Group - Male and Female

Table XVII shows the frequency of choice of the various reasons for the total group (male and female) and Table XVIII shows the reasons classified according to frequency of choice and frequency of order.

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Chapter 11

A GENERAL SURVEY OF INDUSTRIAL EDINBURGH

"Since the 17th century the Scot has made his living in other ways besides farming, fishing, and fighting. He has taken to business and to industry. He has brought into the office and factory those qualities which he had already acquired in his struggle with his not-entirely-friendly environment. They have led him to all countries in the world as he has sought new markets for his goods. They have made him a craftsman, proud of the creations of his hands and of his mind, refusing to be content with any workmanship falling below the standard of first-rate. They have made him an inventor, always devising new machines or improving old machines. They have also made him cautious, less given to reckless adventure than are some other men."

"The Scotsman" Trade Review, 1938.

To Scotsmen, everywhere, Edinburgh is "mine own romantic town", and some are inclined to think that possibly the romance which surrounds it has blinded even its own citizens to its eminence as a city of industry. Oakley (1) is of this opinion. "Edinburgh", he says, "is, in fact, a much more important industrial town than the men of letters (and most Scotsmen, including the people of Edinburgh) realise. A good deal of the smoke of Auld Reekie comes out of factory chimneys." The truth of this statement is most vividly emphasised on looking down on the Scottish Capital from the air. The scores of factory chimneys which rear their smoky tops to the sky must surely convince the sceptic that Edinburgh can justly press her claims to be a city of industrial importance.

Besides being the Capital of Scotland, Edinburgh is in many ways the leading city (excluding London) in the British Isles. This statement may seem somewhat extreme, but let us ponder for a brief moment to realise the status of Edinburgh as a financial centre. Its banking institutions, the insurance companies and the financial houses which are associated with these make its position in the world of finance unchallengeable. The latest statistical information reveals that, of the total population (218,785) who are actively engaged in some occupational category, some (47,363), or 21.6% come under the heading of Commerce and Finance. Of this group (28,959 males and 18,404 females), some 9,194 are employed in Department Stores and General Shops. Wholesale and Retail Dealing in Textiles, Clothing, Drapery and Millinery employs 5,626 persons; Dealing in Grocery and Provisions 3,406 persons; and Dealing in Meat, 2,166 persons. Persons employed in Insurance number 2,630; persons employed in Banking number 1,448; and Publishing and Sale of Books, Newspapers, etc., employs 1,549 persons. When one, therefore, realises that approximately one fifth of the total working population come under the occupational order of Commerce and Finance, then surely such a city can be justifiably considered as a centre of finance.

In addition to its fame as a centre of finance, Edinburgh has always been a home of learning and culture, and it is not unnatural to find that the printing and publishing trades are highly specialised and developed. The allied trades of book-binding, paper-making, map production, the manufacture of printing inks, and the manufacture of paper-making machinery are ancillary to this impetus. It is of interest to note that 11,203 persons are employed in the occupational order of Paper Making, Stationery Manufacture and Printing. The number in this occupational order (6,046 males and 5,157 females) constitutes 5.1% of the total working population. Of the total number employed in this category 478 are engaged in Paper-making; 512 in Cardboard Box Making; 1,822 in the manufacture of Paper Bags, Envelopes, and Stationery; 1,557 in the production of Printed Books and Music; and 5,095 are employed in Printing, Lithography and Bookbinding.

Among the oldest industires, however, in which Edinburgh enjoys prominence is that of brewing. In this activity, Edinburgh is the second largest centre in Great Britain and actually produces three quarters of Scotland's output. The importance to Edinburgh of the brewing industry may be realised when it is stated that six million pounds are invested in it. The brewing industry comes under the occupational order of Food, Drink, and Tobacco, and statistics reveal that 6.6% of the total working population are employed in this order. Of this group (8,603 males and 5,748 females) 3,089 are employed in Beer Breweries, and 571 are employed in Distilling, Rectifying, and Compounding of Spirits. Bread and Flour Confectionery employs 3,856; Biscuit Manufacture, 2,651; and Sugar and Chocolate Confectionery, 1,225. These are the largest individual industries in the occupational order of Food, Drink, and Tobacco.

Edinburgh, served as it is by two great railways, is a junction for important routes, not only by rail, but also by road and sea. The Port of Leith and the roads and railways which serve the city give for manufacturers ready access to raw materials. Coal, shale, iron brick, and timber, as well as foodstuffs, are readily available in bulk, and can conveniently and inexpensively be brought to the city. It does not therefore surprise one to learn that 18,708 persons (17,759 males and 949 females) are employed in the occupational order of Transport and Communication. This group constitutes 8.6% of the total working population. Railways employ 6,586 persons; Shipping Service employs 3,131; Tramway Service 2,055; Cartage and Haulage Contracting 1,705; and Omnibus Service, 1,512.

Already Edinburgh has attracted several of the light industries which, happily, have helped to reduce the number of unemployed in the area. Lighter kinds of machinery, electrical equipment, optical supplies, and card board box manufacture are some of the newer activities which are finding in Edinburgh the conditions which make profitable production possible.

Table I shows the Principal Industry Orders in Edinburgh, and the importance of these occupational trends, which, though perhaps more representative of the adult population than of the juvenile population, must be taken into consideration before we examine the position as it affects juveniles specifically.

Table I

Industry	Both Sexes.	Males.	Females.
Commerce and Finance................	47,363	28,959	18,404
Personal Service....................	27,876	6,386	21,490
Transport and Communication.........	18,708	17,759	949
Public Administration and Defence...	18,533	12,830	5,703
Professions.........................	17,011	8,660	8,351
Manufacture of Food, Drink, and Tobacco........................	14,351	8,603	5,748
Manufacture of Metals, Machines,etc	13,381	12,195	1,186
Building and Contracting, Decorating	11,833	11,340	493
PaperMaking, Stationery Manufacture Printing........................	11,203	6,046	5,157
Wood Working........................	4,592	4,160	432
Clothing Manufacture................	3,959	1,866	2,093
Mining and Quarrying................	2,803	2,755	48
Agriculture.........................	2,731	2,277	454
Entertainments and Sport............	2,727	1,762	965
Textile Manufacture.................	2,578	886	1,692
Gas, Water, Electricity.............	2,256	2,173	83
All other industries................	16,880	10,996	5,884
Total in Industries	218,785	139,653	79,132

Table I and Table II (next page) show, as has already been noted that Commerce and Finance involves some 21.6% of the total population in industry, the percentages of the sexes employed in this particular occupational order being approximately equal. Personal Service, the second in frequency, employs a much greater percentage of females than males, the ratio being approximately six to one. When we come to consider Transport and Communication, we find that the reverse is the case, and that the ratio of male to female labour is twelve to one. Such findings are of immense practical importance to the vocational psychologist, as we shall see later in this chapter. It is interesting to note that the percentage of females (10.6%) engaged in the Professions in higher than the male percentage (6.2%). The preponderance of female over male in this particular occupational order is probably due to the fact that the Nursing Profession has been included, the number in this group being slightly in excess of 3000. Without going into a further detailed examination of Table II, we can see at a glance the relative proportions of male and female labour in the other principal occupation orders and realise how important it is to know to what extent such and such an occupation is a male occupation, and vice versa.

Table II

Industry	Both Sexes	Male	Female
Commerce and Finance	21.6	20.7	23.3
Personal Service	12.7	4.6	27.2
Transport and Communication	8.6	12.7	1.2
Public Administration and Defence	8.5	9.2	7.2
Professions	7.8	6.2	10.6
Manufacture of Food, Drink, and Tobacco	6.6	6.2	7.3
Manufacture of Metals, Machines, etc.	6.1	8.7	1.5
Building and Contracting, Decorating	5.4	8.1	0.6
Paper Making, Stationery Manufacture, and Printing	5.1	4.3	6.5
Wood Working	2.1	3.0	0.5
Clothing Manufacture	1.8	1.3	2.6
Mining and Quarrying	1.3	2.0	0.1
Agriculture	1.3	1.6	0.6
Entertainments and Sport	1.2	1.3	1.2
Textile Manufacture	1.2	0.6	2.1
Gas, Water, and Electricity	1.0	1.6	0.1
All Other Industries	7.7	7.9	7.4
	100.0	100.0	100.0

In addition to giving us information of this nature, a table of this nature supplies us with perhaps the most important data of all, namely, the numbers employed in a particular industry as compared with others. A knowledge of this essential fact is of fundamental importance to the vocational psychologist, since, according to Handrick (2), "youth must be led into occupational life in such a way as not to cause injury to the social or economic structure through the overcrowding of some occupations and the undermanning of others."

Having dwelt at some length on the occupational trends in as faras they affect the adult working population and, indirectly, the juvenile population, it is now necessary to consider much more specifically their influence in the field of juvenile employment.

The population of Edinburgh at the date of the most recent Census, 26th April, 1931, was enumerated to be 439,010, and of that number, approximately 9.3% were juveniles between the ages of 13 and 18. Table III shows us the distribution of this group in terms of age and sex.

Table III

Age	Male	Female	Total
13	2460	2532	4992
14	2881	3103	5984
15	3191	3454	6645
16	3623	4200	7823
17	3672	4164	7836
18	3419	4367	7786
Totals	19246	21820	41066

From the above we can ascertain, that the ratio of group tested in this experimental scheme (1838) to the total number in the 13 - 14 group enumerated above, is 16.9%. The numbers included in the 13 - 14 age groups above do, of course, contain pupils who attend schools other than the Edinburgh Education Committee's schools, and are, therefore, not represented in the table of 'leavers' which is shown on page 76 . The group tested in this scheme is accordingly much more representative of the 13 - 14 population found in Education Committee schools than of the total 13 - 14 population.

A study of the number of Unemployment Books exchanged within the year 1936-37 reveals in what way and to what extent the juvenile population, between the ages of 14 and 18, are employed. Table IV shows that 23,738 juveniles (11,450 males and 12,198 females) are employed in the principal occupation orders. Besides providing us with the statistical fact that 65.8% of the juvenile population are remuneratively employed between the ages of 14 and 18, this table gives us a very accurate insight into the occupational trends of the area in as far as they affect juvenile labour. It will be noted that 33.7% of the juvenile workers are employed in the Distributive Trades. This finding may be surprising, but it must be remembered that Edinburgh has long held a prominent place as a shopping centre and that many old-established firms in the city have world-wide connections. It should also be noted that the representation of the sexes within this Distributive Trade Group is approximately equal, there being 3,957 males and 4,042 females employed.

The second occupation order is that of Bread, Biscuit, and Cake manufacture. There are 1,762 juveniles employed in this industry, 554 being males and 1208 females. In this instance the proportion of female to male labour is approximately two to one, a highly significant fact.

The Building Trades occupy third place in the order of frequency, there being somel,305 juveniles (1181 males and 124 females) employed. This industry is, as we might expect, predominantly male, the proportion of male to female labour being in the region of ten to one. It is, however, of the greatest interest for us to know that there are 124 juveniles of the female sex employed in the Building Trades.

As we have already noted, the Printing and Publishing Trade is an important factor in Edinburgh's industrial progress. This industry occupies fourth place in the juvenile occupational frequency, a much higher

Table IV

Industry	Boys	Girls	Total
Distributive Trades........................	3957	4042	7999
Bread, Biscuit, and Cake Manufacture......	554	1208	1762
Building Trades............................	1181	124	1305
Printing and Publishing Trade.............	328	744	1072
Rubber Manufacture.........................	200	576	776
Laundries..................................	104	661	765
Engineering Trades.........................	560	86	646
Cardboard Box Trade........................	106	497	603
Office Workers.............................	292	298	590
Textile Manufacture........................	55	530	585
Metal Industry.............................	369	213	582
Hotel, Boarding House, and Club Service...	194	368	562
Breweries, Distilleries, etc..............	321	220	541
Sawmilling and Woodworking Trades.........	406	111	517
Confectionery Trade........................	40	472	512
Railway and Road Transport................	372	87	459
Tailoring and Dress Trades................	44	408	452
Construction and Repair of Vehicles.......	357	58	415
Entertainments.............................	142	215	357
National and Local Government Service.....	197	64	261
Artificial Goods Manufacture..............	86	141	227
Electrical Wiring Trade...................	203	22	225
Commerce (Insurance and Banking)..........	124	76	200
Dyeing and Cleaning Trade.................	98	99	197
Preserved Food Manufacture................	52	130	182
Chemical Manufacture.......................	45	133	178
Bleaching Industry.........................	25	88	113
Paper and Stationery Manufacture..........	37	74	111
Shipping Service...........................	79	12	91
Scientific Instrument Making..............	54	33	87
Glass Manufacture..........................	42	42	84
Tobacco and Cigarette Manufacture.........	7	47	54
All other occupations......................	909	319	1228
Totals	11540	12198	23738

place than it occupies in the adult occupational frequency. There are 1,072 juveniles (328 males and 724 females) employed in this industrial category. It does surprise one to find that more than twice as many females as males are engaged in this particular trade, but this is due to the fact that the more routine and unskilled types of work are performed by female labour, while the highly skilled types of work, in so far as they can be successfully performed by juvenile labour, are done by boys.

The Rubber Trade, the fifth in the industrial order of frequency, employs three times as many females as males, and here again, the explanation offered in the paragraph on the previous trade, that of Printing, is also true.

An analysis of the various occupation orders, in so far as they affect the juvenile worker, could go on indefinitely, and as it is not the specific purpose of this thesis to analyse such statistical information, suffice it to note that such an analysis would emphasise certain cardinal points:-

(a) the relative number of juvenile workers employed in one occupational category as compared with others. In other words, it should be the concern of all connected with juvenile labour that there should be development and effective use made of the man power available for industry. There must, therefore, not be an over-crowding of one particular industry to the detriment of another.

(b) the relative proportions of the sexes employed in the various occupational categories. No longer can one say, without due consideration, that such and such an occupation employs male workers exclusively. Sex differences in relation to industrial orders are becoming increasingly non-existent.

In addition to revealing these important facts, a survey of the information contained in Table IV must surely convince us that the manufacturing industries of Edinburgh are remarkable for their diversity, and we readily see that there is a wide variety of occupations in these industries from which boys and girls may select a career.

Before concluding this chapter, let us glance for a moment at the question of progressive and non-progressive employment. The age for entering apprenticeships varies in particular industries. As a general rule, fifteen or sixteen years of age is the age recognised in most trades, but employment in the same establishment may begin before the attainment of the sixteenth birthday in such work as errand-going, etc. In other establishments where there are no prospects of an apprenticeship, or of employment which is to be progressive, the period between the age of leaving school and the age of entering a career is a critical one. Too often the opportunities for continued education are overlooked by the boy or girl who is intent on leaving school on attaining the minimum statutory school leaving age of fourteen years. Such is the impetuosity of youth at this early age that they are content to leave school without any settled prospects as to a future career, and as a result they find themselves educationally ill-prepared for taking up an apprenticeship when an opening occurs. The raising of the school leaving age in September 1939 should do a lot to alleviate the difficulties of this problem. With a further year at school, the transition of pupil to industry will be a much easier process than it is at present. Table V reveals some interesting information on this question of apprenticeships, progressive and non-progressive occupations.

Table V

	Apprenticeships	Progressive Occupations	Non-progressive Occupations	Total
Males	552	934	1059	2545
Females	46	2253	80	2379
Total 1938	598	3187	1139	4924
Total 1937	522	3509	1648	5679
Total 1936	399	4008	1617	6024

Of the 4924 juveniles placed in occupations in 1938, 12.1% were placed in the apprenticeship category, 64.7% in progressive employment, while 23.2% were placed in non-progressive employment. Table VI reveals that, when we consider the percentage number employed in each of these three categories, the placings in apprenticeships tend to rise while those in the non-progressive category tend to fall.

Table VI.

	Apprenticeships	Progressive Occupations	Non-progressive Occupations	Total
% in 1938	12.1	64.7	23.2	100.0
% in 1937	9.2	61.8	29.0	100.0
% in 1936	6.6	66.5	26.9	100.0

The matter of choice of employment and vocational guidance is very closely linked up with the Education (Scotland) Act, 1936, which provides for the extension of the school leaving age to 15 years as from 1st September 1939. Education Committees will have the power, however, to grant exemptions to children of 14 in cases where it can be shown that they have secured beneficial employment. Though the Act defines in general terms what is meant by "beneficial employment", the responsibility is placed on the Education Committees of determining the specific conditions which must be fulfilled before applications for exemption can be granted. Education Committees in various areas have drawn up lists of occupations which could not be regarded as falling within the category of beneficial employment, and in respect of which exemption would not therefore be granted. Most of the occupations contained in those lists are ofthe non-progressive or "blind-alley" type, and their exclusion from the benefit of exemption is in conformity with the spirit of the Act. It is of interest to note that a survey of the lists of unsuitable occupations, which have been drawn up by the various Education Committees, shows a large measure of agreement as to the occupations for which exemption should be refused.

What constitutes beneficial employment may be determined in a negative way by excluding certain types of occupation, or in a positive way by prescribing essential conditions. It is obvious, for instance, that an occupation must be suitable for the child's physique; this is amatter for the School Medical Officer, whose consent is necessary before an employment certificate can be granted. In a like manner also, an occupation must suit the child's mental and temperamental make-up; this is a matter for the Vocational Guidance Officer. Besides, it is desirable that the child should be assured of continuous employment, good working conditions, reasonably short hours, and prospects of obtaining useful training in an established branch of industry, trade, or commerce.

The Education (Scotland) Act, 1936, therefore stresses the importance for juveniles of entering apprenticeship or progressive occupations at an early age, and has as its primary consideration the welfare of the young worker. The raising of the school leaving age and the greater interest which is now being taken in the entry of juveniles into industry are notable advances and demonstrate very vividly that there is a real sense of responsibility felt by the community for the boy or girl leaving school, especially when they are of the poorer classes.

In conclusion, one may say that in so far as it is a residential city rather than a great industrial centre, Edinburgh enjoys a measure of comparative immunity from the grievous ills of unemployment which are so prevalent in many of our "depressed areas". The problem of the welfare of the juvenile worker is accordingly proportionately less acute in the Capital than it is in many other towns and cities of Scotland.

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Chapter 12

THE PROBLEM OF OCCUPATIONAL PLACEMENT IN AN EDUCATIONAL AREA

In the devising of a scheme of vocational guidance it becomes very necessary for the vocational psychologist to make himself thoroughly familiar with the work carried on in the area by the Local Exchanges and Bureaus of the Ministry of Labour. The purpose of this chapter is, therefore, to describe, in as concise a form as is possible, the work in occupational placement which is carried on in the Edinburgh Educational Area.

One of the most important agencies in the occupational placement and guidance of the young people of today is the Local Juvenile Employment Exchange or Bureau. The work undertaken by this department is primarily concerned with the placement of the boys and girls who have left the advanced divisions of our elementary schools on attaining the age of fourteen, the "school leaving age". This placement work is carried on in certain areas by the Ministry of Labour through the Juvenile Employment Exchanges, and, in certain other areas, by the Local Education Committees through the Juvenile Employment Bureaus. The Ministry of Labour is assisted in the operation of the Exchanges by Advisory Committees for Juvenile Employment; and the Local Education Committees are assisted in the administration of the Bureaus by sub-committees, known as Juvenile Employment Committees. This system of occupational placement would, at first, seem to be rather intricate, and its complexity is due to the fact that some of those departments are under one jurisdiction and some of them under another. This state of affairs may be explained as follows: by law (1), the Local Education Committee has the right "to exercise choice of employment powers", with the result that in some areas the Local Education Committees have accepted this responsibility, and, in other areas, the work is carried out entirely by the Ministry of Labour. It should be perhaps pointed out that Advisory Committees for Juvenile Employment were appointed by the Minister of Labour and exercise their power under the provisions of the Labour Exchanges Act (1909). On the other hand, the Juvenile Employment Committees which, as has already been pointed out, may be administered by the Local Education Committee or by the Ministry of Labour, were appointed by the Minister of Labour and exercise their power under the provisions of the Education (Choice of Employment) Act (1921) and the Unemployment Insurance Act (1923). So that in occupational placement work these separate committees have to be distinguished, even although they fulfil the same function, that of advising and placing young people in suitable careers.

In the realm of Juvenile Employment, Edinburgh's chief claim to fame is that it was the pioneer educational area to take advantage of the powers given in those days to School Boards by the Scottish Education Act (1908) to incur expenditure in the establishing of Juvenile Employment Bureaus. The educational legislators in Edinburgh were not slow to realise thatimmense benefits would accrue if such a scheme were adopted. Accordingly, in 1909, a Juvenile Employment Bureau was established in the city, and this Bureau has supplied the pattern on which many subsequently established Bureaus were modelled. There was thus a Bureau, firmly established and vigorous in action, before the Labour Exchanges Act of 1909 became operative. It should be noted at this juncture that there is no Education (Choice of Employment) Act in Scotland and that the Scottish Education Acts are by no means parallel with their English equivalents.

After this School Board Juvenile Bureau had been in operation for a few years, the Ministry of Labour ventured to suggest to the School Board of that time that it was not conducive to good industrial organisation for two separate bodies to perform the same function in the one area. A scheme of co-operation was ultimately decided upon, whereby all the choice of employment and advisory work was to be undertaken by the Education Department's officers, and the registration and placing work undertaken by the Ministry of Labour's officers. Cognisant of the fact that the juveniles might be exposed to the obvious dangers of attendance at Labour Exchanges, where large bodies of adults usually congregate, the School Board Authority arranged that the Juvenile Employment be situated in the Education Offices. So unique is this scheme of co-operation that it has been referred to as "that 'rara avis', two separate departments working in harmony side by side". With the exception of Edinburgh, every other educational area in Scotland has its Juvenile Employment work entirely controlled and executed by the Ministry of Labour. Despite the fact the Edinburgh scheme has been "made the model for similar organisations in the United Kingdom and America"(2), it has remained as the pioneer in the movement for Juvenile Employment agencies.

In 1927, the scheme was further modified and a Joint Juvenile Advisory Committe was formed with equal representation from both sides (Ministry of Labour and Education Committee)+ with an educational Chairman. Joint Secretaries were appointed, and it is of interest to consider their duties in so far as they affect a vocational psychologist.

(a) <u>Secretary appointed by the Education Committee</u>

(i) To take charge of the work connected with Choice of Employment; to advise parents as to the careers for which their sons and daughters appear most fitted when they leave school.

(ii) To give information about Technical, Commercial and General Knowledge Continuation Classes having relation to particular trades, industries and professions.

(iii) To perform the work connected with the After-Care Committees, except that part which has been termed Industrial Supervision.

(b) Secretary appointed by the Ministry of Labour

(i) To exercise general control over the work of Registration and Placing of Juveniles and of Unemployment Insurance.

(ii) To carry out the work of Industrial Supervision.

(iii) To make the investigation necessary to the issue of leaflets, booklets, and summaries giving information regarding the qualifications required in the various occupations in the City, the rates of wages, the conditions of employment, prospects, etc.

So intimate, therefore, are the duties of those secretaries with the work carried on by the vocational psychologist, that constant collaboration is a necessary requirement, if any benefits are to accrue from a scheme of psychological testing for vocational guidance purposes.

So interesting is the advisory procedure in so far as it affects the juvenile worker and which is carried out by the Juvenile Employment Bureau, that a description of its method and technique will now be attempted. In the Edinburgh Educational Area there are two Fixed Dates for terminating school attendance on attaining the minimum statutory school leaving age of fourteen years, they are March 1st and Sept. 1st. Immediately prior to one of these Fixed Dates, the attention of the pupils is directed towards the subject of employment as a result of interviews with the headmaster and class teachers in connection with the filling up of Juvenile Employment Cards. At this period the young person is specially instructed to consult his parents, who may be present at the interview, regarding certain information entered upon the cards. A "Scholar's Card" is completed at the same time, and given to the juvenile. Special meetings are also arranged at which the pupils, who are leaving school, are addressed by the Organiser of Continuation Schools, the Juvenile Employment Officer, and a member of the Education Committee. Stress is laid upon the desirability of (a) remaining at school until suitable employment has been secured, (b) making full use of the Juvenile Employment Office, (c) attendance at suitable Evening or Day Continuation Schools after leaving the Day School, and (d) the detrimental effect of entering non-progressive employment, and frequent and needless changeof occupation. The young people are interviewed individually at the Juvenile Employment Office, which is open on two evenings per week specially for the use of parents and for the use of those juveniles who are unable, by virtue of their employment during the daytime, to come up to the office, There is a scheme of After-Care covering some forty schools, but this only applies to certain sleected children in need of this attention, and to whom the school teachers have specially drawn attention. These After-Care Committees are three in number, (a) Flora Stevenson Committee, (b) James Clark Committee, and (c) Leith District Committee. A special lecture scheme by experts, covering a wide range of topics and careers, is organised each year for young people leaving Secondary and Advanced Division Schools. A Monthly Bulletin to Schools on matters of interest to leavers is also issued from the Juvenile Employment Office. All the school medical history, educational progress, and Employment Cards are filed in the Juvenile Employment Office for the confidential information of the Juvenile Employment Officers, when required. These cards form what is known as the juvenile's "Unit", and to this Unit has been added the individual psychograph, the product of this experimental scheme of vocational guidance.

The Ministry of Labour Officers attend to all the registration and vacancy work, and also to all unemployment insurance work. There is a scheme of industrial supervision under which all juveniles placed by the

Juvenile Employment Office are visited, when possible, at their work, and the employer or foreman interviewed. These juveniles are also invited with their parents to an "Open Evening" for the purpose of discussing prospects, etc.

Before concluding this chapter, let us consider what are known as "Junior Instruction Centres". In those depressed areas where the number of jobs available could not satiate the demands of the juvenile workers, the task confronting the Juvenile Employment Bureaus and Exchanges was one of perplexity. To a very large extent, the unemployed between the ages of 14 and 18 are elementary or advanced division school leavers, and have not usually attended a junior technical school where, in certain instances, the training received is a practical guarantee of employment. This state of affairs forced the Ministry of Labour to devise some method of combating the problem of unemployment between the ages of 14 and 18.

The Junior Instruction Centre is an institution of fairly recent origin, and centres similar in nature to those which now go under that name were started by the Board of Education shortly after the termination of the World War. In 1922, however, very few of these pioneer centres remained. Shortly after this, the industrial structure of this country was shaken to its foundations, and the spectre of unemployment stalked about the land in company with the sordid picture of hosts of ill-nourished men, women, and children clamouring for jobs around the Labour Exchanges in every district of the realm. Such a state of chaos could not exist for long, and the Government was faced with the problem of alleviating the distress of those masses of unfortunate people, and, in addition, having to make adequate provision for the juvenile as he left the sympathetic environment of the school in a sometimes vain search for employment. The Junior Instruction Centres, previously administered by the Board of Education, were re-instituted in 1926, but were now to be regarded as the responsibility of the Ministry of Labour. According to Lord Elgin (3), the chairman of the National Advisory Council for Juvenile Employment in Scotland, "the primary function of a Junior Instruction Centre is to maintain and improve employability". Essentially, the Junior Instruction Centre is an attempt on a national basis to undertake the responsibility of the maintenance of equanimity of mind, the continuance and development of physical fitness, and the stimulation of the growth of occupational adaptability of those unfortunate juveniles who find themselves in the unhappy position of being, through no fault of their own, unable to find an occupation.

Happily, unemployment amongst juveniles is not the problem that presents itself to other Juvenile Employment Exchanges, Bureaus, and Junior Instruction Centres, but it must, of necessity, receive the attention of all who are concerned with the industrial well-fare of the youth of our City. As has been emphasised previously, the main function of the Junior Instruction Centre is to prevent demoralisation which so soon threatens boys and girls when, on leaving school, they find no employment and have nothing to occupy their minds and hands. An opportunity may be taken here of dispelling the misunderstanding, which not infrequently exists, that the curriculum of the Junior Instruction Centre is vocational in nature. The function of the Centre's curriculum is to keep the mind and body of the juvenile alert and active by means of mental and manual instruction of a non-vocational type, which will help him to become absorbed or re-absorbed into employment as soon as an opportunity may occur. A Junior Instruction Centre is, therefore, an education al centre.

Prior to 1st Sept. 1938, there were two Junior Instruction Centres in Edinburgh fulfilling this all-important function. On Sept. 1st, however, a scheme of centralisation was adopted and now there is one Junior Instruction Centre, at Regent Road School. Thisnew development, amongst other things, has done much in the way of promoting that state of industrial well-being of the juvenile population which is so essential in occupational life.

The foregoing paragraphs give a very brief summary of the Juvenile Employment work which is carried on in the Edinburgh Educational Area, a knowledge of which, however, is of fundamental importance to the vocational psychologist who, to some extent, hidden away within the sheltered environment of the psychological laboratory, must necessarily get into touch with the outside world of industry and all that it stands for.

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Chapter 13

SOME COMMENTS !

In this chapter the author intends to record some of the comments made by the boys and girls who were tested in this scheme of vocational guidance. About a fortnight after the pupils had been tested, they were asked to write anonymous essays describing, in their own language, what they thought of the tests. The following are some extracts from the essays. B = Boy G = Girl

(1) B "The tests which we got a few weeks ago were very interesting, although the one with the pegs was, in my opinion, a lot of rubbish. What good does it do people who want to become clerks, etc. to put pegs in holes. That, in my opinion, is a test for coming switch-board operators."

(2) B "I thought that the tests were very good as it let you know if you are clever with your hands. The designs made you use your brain to put the pieces of wood together."

(3) B "I think that the tests were a great waste of time and I think everybody is intelligent enough to find a job for themselves without the help of tests."

(4) B "The tests where you had to make designs was very easy at first but got harder and harder. The difficult designs made your rattle your brains to see where they go."

(5) B "The tests which we got a fortnight ago were good, for they

showed how skilful your hands have to be as well as your brains. They were also a change from school work."

(6) B "The tests were really quite easy and enjoyable, but they did not seem to have anything to do with school work, and I would rather have had what we were supposed to do".

(7) B "Some of the tests were easy and some were not. It was just a waste of time doing them, but it was better than doing lessons."

(8) B "The tests we got last week made your waken up and see how quick-witted you are and how nimble your fingers are".

(9) B "Making the block designs was very interesting, but I don't want to be a designer, so I don't think it was much use for me."

(10) B "The tests we had recently were very attractive and interesting. They show that speed is very important in thinking. I think they are meant to show whether you are fit for brain work or handiwork".

(11) B "I am not very good at school work, but I think I did very well in the design test and in the test where you put pegs in a board."

(12) B "We were told that the tests were to see what job you were suited for. The tests were very enjoyable, but by the time we get the results we shall be working."

(12) B "The tests were quite easy and very good fun. They were <u>not</u> a waste of time, as my pal is putting down on his paper."

(13) B "The tests were easy, exciting, and puzzling, just like a cross-word puzzle."

(13) B "The tests we received I enjoyed very thoroughly. I thought they broke the monotony of the ordinary day routine."

(14) B "I thought that some of the tests were very perplexing, especially the test of the coloured shapes, in which the green shape was the hardest, although the yellow shape was also very intricate. The test with the

nuts and bolts was easy, and the pegboard was just as simple. The tests seemed to me to have no object at all, but they were good fun.

(15) B "I thought that the tests were really useless and that if references are needed for a job, surely the teacher we have most would be the best judge."

(16) B "The design tests I liked very much, but as I did not see the true value of the manual test, I pass no opinion on it."

(17) B "I think the tests of a week ago were exceedingly useful, because I think they can tell me what sort of work I am most suited for".

(18) B "One or two of the designs needed a bit of thought, but even then they were too hard for me."

(19) B "The impression made on me by the tests was that they made one see if he could work better with his head or his hands."

(20) B "I think the tests were very useful, because the marks you manage to get enable your future employer to realise what kind of a person he is going to employ. It seems a good thing, both for the boy and the employer."

(21) B "I enjoyed all the tests, even the Arithmetic and English ones. I especially like the test where you have to make designs with coloured blocks. I asked the student who tested me if I could take a set home to practice with them. He said that Mr. MacDonald would be annoyed. I was sorry that I couldn't manage the last one out."

(22) B "The tests seem to be a very useful method for getting boys and girls their right jobs. My father thinks the same. He has been reading a lot about testing and the way they help you to choose your right job."

(23) B "I thought that the test with the nuts and bolts was a bit stupid in a way. Still, if it was stupid they wouldn't have given usit."

(24) B "I thought the tests were good, but some of the other boys said

they were foolish."

(25) B "I think the using of coloured blocks lowered our dignity. You would think we were babies. But if they will help us to find a job, then I agree with it".

(26) B "I think the tests were good and interesting. We also missed some lessons I don't like and I wish we had tests every week. You don't seem to have to use your brain nearly so much when you are doing these tests."

(27) B "The tests which we had a fortnight ago were very exciting and made my school-mates work very hard. When I finished my tests, I used to like to watch my pals. Some of them looked very funny."

(28) B "The way they kept you going in the nuts and bolts tests, you would think you were a machine instead of a human being."

(29) B "The tests were interesting and did not tire us. It was amusing and funny seeing a class of boys sweating to put those wee nuts on the bolts and the hundred pegs into a board."

(30) B "The test with the nuts and bolts was to see if you had nerves. I was very nervous, because I dropped a whole lot of the nuts on the floor. But I hadn't to pick them up, because the teacher did that for us. It seems that if you stop to pick them up, it spoils your score."

(31) G "The tests we got a fortnight ago were very interesting and I would not mind if we got them every week. The test I liked best was the one with the nuts and bolts. I think I would have done much better if I hadn't become hot and bothered. I wish I had been one of the students just for that day. It would have been rather funny to see ourselves as others see us."

(32) G "I liked the tests very much indeed. I think it is very necessary

to see how quickly your hand can move, as this is to important in quite a lot of jobs."

(33) G "I liked every test we got. I don't think there was really enough for me to do in a lot of the testsfor I seemed to be finished before most of my school-mates. I might, of course, have been working too quick to get marks for being accurate."

(34) G "I think most of the tests were very difficult. You needed to have quick and alert brains to get all the designs out in the time. The one thing that struck me most in the tests was that the teachers and students seemed to be very exact about the time."

(35) G "I thought the tests were quite interesting. I myself preferred the tests where you try to put 100 pegs into small holes in a board. I was interested in the things they gave us to do, though I know I wasn't good at some of them. I enjoyed myself very much."

(36) G "I thought the tests were very exciting, but rather peculiar on the whole. I would have liked to have heard more about them and how I got on in them. I suppose they will tell us later on, when they have got all our tests corrected."

(37) G "The manual tests were quite good fun, but rather childish."

(38) G "I thought it was rather silly giving us a lot of those tests, especially the one with the screws. After all, some people could normally do things with their hands became excited and fumbled. It made me feel quite silly."

(39) G "The tests we got a fortnight ago were all very pleasant. I liked the test where you had to make designs with little blocks. I think I did quite well. Of course I am very interested in making coloured designs and I suppose the practice I have had helped me in the test."

(40) G "I think the tests we had a fortnight ago were very interesting

and tested your skill. But I don't see why girls should get the test with screws, as I think it is mostly boys who need this kind of thing. Of course, it tested quickness and that is quite important. The tests with the blocks were a little better because they tested your eye for colour and design."

(41) G "I think the examination we had a fortnight ago was quite a good thing, because you felt that nobody would come down on you for not doing well and that your parents and teachers knew nothing about your marks. With this examination, I was told it was to see which kind of a situation you were suited for. I think this is rather a funny way of finding out, because there are so many children that I do not see how you can get everyone the situation he or she is suited for."

(42) G "My impressions of all the tests are very pleasant. I liked the manual test best. It certainly tested how quick your brain and fingers work. I think thismethod of testing children is a very good idea, and if it works out it will be a great help to the children leaving school."

(43) G "I liked all the examinations we got last November, because not only were they amusing but they tested your speed, concentration, and skill. You had to keep your mind on your work and use your eyes as well as your hands if you were going to do well."

(44) G "I enjoyed myself, especially in the nuts and bolts test. It was very interesting and shows you that small things can be very difficult and also very easy. It's no use getting into a temper when a nut falls on the floor or you can't screw the bolt up, because it only makes you worse."

(45) G "I thought all the tests were very easy, especially the one with the nails, a child not at school could do it. I thought it was very

stupid for the teachers to give 2nd and 3rd year pupils this test. Some of the girls thought that this was a good test, but I didn't."

(46) G "First of all there was the test with the bolts, screws, and washers. I thought we got that to see if you were good at mending little things in the home e.g. clock, mangle, wireless, etc. Then there was a board with a hundred holes and a great many little sticks. I thought that might be to see if you were good at typewriting. Then there was the test with the blocks and the designs. I thought that would be for anything where you had to make a pattern. For instance, design on night-dress, tiles in the fireplace, designs in the garden, etc. Then there were the Arithmetic and English Tests which were very like school work and I didn't like them so much. I thought they gave us these to see if we would make good clerkesses or secretaries. Then there was rather a funny test with circles and slots, I suppose that is really for boys who hope to become electricians and motor mechanics."

(47) G "The test with the small blocks anddesigns learnt you commonsense."

(48) G "I liked the test for speed and accuracy best, because it needed a person who could work quick so as to complete the work in the time you were given."

(49) G "I liked all the tests except the one with the grey blocks. Some of sides hadn't any paint on them and some of the sides had and it kind of got you all mixed up."

(50) G "The test that I liked best was the English Test, especially the Geography and History parts. I enjoy those subjects, but some of the questions in this test were very tricky and you had to rack your brains to find the answers."

Chapter 14

OBSERVATIONS AND SUGGESTIONS

"They are happy men whose natures sort with their vocations".
F. Bacon, "Of Nature in Men".

In this final chapter the writer intends making certain observations and suggestions as a result of this experimental investigation in the psychological testing of children for vocational guidance purposes, in the hope of establishing such a scheme as a permanent feature of the educational system in the Edinburgh Area.

(1) The cost of a scheme of vocational guidance would be small in comparison with the services rendered.

(2) Its administration need not vitally interfere with the ordinary routine work of the schools concerned.

(3) With few exceptions, the teaching staffs co-operated to the fullest extent with the vocational guidance psychologist and, if such a scheme was made a permanent feature, every assistance could be expected from them in the administration and scoring of the tests.

(4) A master, preferably the Headmaster, should be given the task of generally supervising the conduct of the scheme in so far as it affected his particular school.

(5) All individual teachers taking part in the scheme should receive some definite training in the methods of vocational guidance and the methods of test administration.

(6) With the raising of the school leaving age as from 1st Sept 1939, a

very favourable opportunity would be given of administering most of the tests in the battery in the pupils' last year at school.

(7) The assistance of the School Medical Service is of fundamental importance in any scheme of vocational guidance.

(8) A Vocational Guidance Officer should be appointed to supervise any scheme of vocational guidance. The duties of such an individual might be as follows:-

(a) To train teachers in the various schools who are to be responsible for the general administration of the scheme.

(b) To plan the scheme of vocational guidance, devise record forms, suggest the use of specific tests, etc, etc.

(c) To publish norms for the various tests.

(d) To supervise the completion of the individual psychographs.

(e) To be personally responsible for the conduct of interviews given to children involved in the scheme.

(f) To apply all published occupational analyses to the study of those in his own area, and when possible supplement the already existing standardised occupational psychographs.

(9) The following additional specific points should be borne in mind in devising a general scheme:-

(a) The chief difficulty experienced in this present investigation has been in connection with the Practical Intelligence which must, of necessity, be given individually. It will be remembered that the responsibility of the administration of this test rested entirely with the students from the Psychology Department who had been specially trained in performance test methods. One cannot, however, assume that a supply of these specially trained students would be available each year, so that some other way out of the difficulty must be sought. It might be a feasible proposition to spread the practical intelligence testing over a period of three years but this would, in turn, involve making certain teachers wholly responsible for the administration and entrusting them with the compilation of the records of each pupil tested. One can only hazard a guess as to the efficacy of this method, but it is generally held that it would prove its practicability in time, although it lacks the exceptional convenience of the method used in the present investigation.

(b) It has been suggested that the vocational guidance officer would probably obtain more representative and more accurate information from the "Choice of Occupation" Questionnaire, if this was completed during the last term of the child's scholastic career. The reason for this is fairly obvious. If the child, during his stay at school, is constantly reminded of the great necessity of making a wise and prudent choice of a career, the information which he will give, when he comes to complete the Questionnaire, will probably be much more rational and consistent than when he is asked to complete it on the spur of the moment.

This scheme of vocational guidance, as has been emphasised before, has been devised primarily with the object of establishing a system which could have universal application in educational areas. But in determining whether or not such a scheme should become a permanent feature of the educational system of the area, the proved success of the present scheme from the information of the 'follow-up' must be carefully considered.

The Juvenile Advisory Committee have set upa small Committee to watch the progress of the experiment, and a further report will be submitted when the first results of the 'follow-up' are available. While it is intended that two head teachers should act on this Committee, it is suggested that there should be also representatives from those teachers in the service who have had some training in vocational guidance. It might be well, indeed, if all teachers in the Committee's schools, who have had special training and who possess aptitudes for this work, could be brought into association with a view to planning a future vocational guidance service for the schools, in which the leading principle should be co-operation between school staffs, with their long experience of the pupils, and the officers of the Juvenile Employment Office, with their more intimate knowledge of the conditions obtaining in industry and commerce.

It has been the constant aim of the writer throughout the research to devise a means whereby juveniles, in their somewhat arduous and often ill-planned quest for the most suitable occupation, are given some concrete evidence concerning their mental, temperamental and physical characteristics and what they appear to fit them for in occupational life. He realises that "in some sense and in some effectual degree, there is in every man the material of good work in the world; in every man, not only in those who are brilliant, not only in those who are quick, but in those who are stolid, and even in those who are dull".+ It has been his constant task to unravel the mysteries of this "material", a task which has impressed upon him the supreme importance of vocational guidance in the determination of the industrial welfare of humanity. Though we are still far off from the valley of industrial happiness and bliss, the milestone will soon be reached when the imposed companionship of Occupational Misfit, that insidious deterrent to industrial progress, will cease to exert its disagreeable influence on mankind. When this ideal state of affairs has

+ Gladstone

been attained, we shall then be in a position to read the following quotation from Ruskin with greater equanimity of mind:-

> "So much for the master's motto, 'Every man in his place.' Next for the labourer's motto, 'Every man his chance.' Let us mend that for them a little, and say, 'Every man his certainty', a certainty, that if he does well, he will be honoured, and aided, and advanced in such a degree as may be fitting for his faculty and consistent with his peace..... It is the law of good economy to make the best of everything. How much more to make the best of every creature!"

Future of England.

As in the case of Gladstone, we see that Ruskin has taken cognisance of the facts of individual differences and has acknowledged, in no small degree, that industrial harmony can only be reached and realised in proportion as the individual differences in mankind are appreciated and evaluated by industrialist and psychologist alike.